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THE VITAL INDEX IN DEVELOPMENT

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There is perhaps no more important problem for education than that of the physiological development of children during the school age. It would seem that the rate of growth sets a limit to learning beyond which the skill of the teacher can not go. For since the work of Porter (20) there has been good reason to believe that learning is not only conditioned by growth but that in these earlier years the rate of physiological maturing and that of mental development are closely related. Not only this early study but the later work of Smedley (24), Crampton (7), Goddard (13), Arnold (1) and others show that physical and mental retardation go together. The work of Gilbert (12) on the other hand would indicate that the reverse is true. Whether or not these differences in conclusions are due to technique and methods of classification is still a problem. It would seem that there ought to be a close agreement between the grade position of a pupil and the teacher's estimate of his ability, yet the conclusions of investigators using these two methods of classification are not in agreement.

A preliminary investigation of the writer (9) using the grade age method of classification agreed in the main with the conclusions of Porter (20) and Smedley (24). It was noticed in this study that the vital indices of those children below grade averaged much lower than that of those above grade. A study was accordingly begun using the mental age as the basis of classification. It was hoped if a satisfactory method were employed which would select out the mentally

retarded and accelerated that a comparison of the anthropometric measurements of the two groups would reveal some fundamental difference. The two hundred children of the Colorado Teachers' College, one hundred and four boys and ninety-six girls were selected for the study. The number is small but the growth curve of the individual is very similar to that of the group. And the small number enabled one to keep sight of the individual in the group.

The following data were secured, the name, age, physiological age from the teeth, the mental age, grade, height, weight, vital capacity, condition of the teeth and of the tonsils, and the presence or absence of nasal obstruction. To these were added from the records of the school the results of the eye and ear examinations made by Dr. J. D. Heilman of the department of psychology. The height and weight were measured by scales and stadiometer in use in the clinical department. A wet spirometer was used to determine the vital capacity. For this measurement the children were taken in groups and the element of competition introduced into the test. Each child was permitted a number of trials and the best record taken. It may be stated here that the children had had frequent experience with the spirometer. From the above the relation of weight to height was determined, believing that this index would express the general state of nutrition of the individual. The vital indices were also computed. It will be remembered that this index marked the greatest difference between the accelerated and the retarded groups in the preliminary investigation. The classification into the three groups, the accelerated, the normal and the retarded, was based upon the 1911 revision of the Binet scale. The averages are given in the tables.

Historical. In 1889 Gratsianoff (14) in Russia measured the children of Arznus and brought out the fact that the successful children were larger than the unsuccessful and that their rate of growth was quicker. Sack (23) rejected this because of the small number but his own investigation confirmed Gratsianoff's (14) results. These studies were unknown to Dr. W. T. Porter (20) when he began his work in St. Louis, which was undertaken to find the laws of growth, in order that the school work might be fitted to the ability of the pupil. The method of classification was that of the grade age. Porter raised three questions all of which he answered in the affirmative. Are dull children weaker if size is to be taken as the index of strength? Is mediocrity associated with mediocrity of physique? Is there a physical basis of precocity? Bright children were found to be taller and heavier

than dull. Successful children were also found to have larger chests than the unsuccessful. These facts led Porter to conclude that,

"No child whose weight is below the average of its age should be permitted to enter a grade beyond the average of its age except after such a physical examination as shall make it probable that the child's strength shall be equal to the task."

In November of the same year J. Allen Gilbert (12) of Yale published his Researches on the Mental and Physical Development of School Children for the purpose of determining the correlation between the physical and mental development. He classified pupils on a basis of the teacher's estimate as bright, average and dull. He writes in regard to the results:

"The statement is made by Porter that the brighter the child the taller he is. Brightness and dullness in his tests were decided by the examination grades, which it is needless to say are often very poor mental tests. In my results no such relation could be traced."

The same negative conclusion was drawn in regard to weight. The correlation between vital capacity and mental ability was also indifferent and limited. In his Iowa studies of 1897 the same negative conclusions were reached. If anything positive can be stated, Gilbert thinks, it is that the heavier and taller children are the duller.

G. M. West (26) from his study of school children of Canada found as a general rule that the poor, that is the dull children, were more fully developed than the good. In fact the poor were the better developed throughout except girls at fourteen and boys at thirteen. For this reason he considered it safe to conclude that precocity bore an inverse ratio to bodily development.

Smedley (24) reinvestigated the conclusions of Porter using the anthropometric measurements of the school children of Chicago. It is clear from his data that the children who have made the greater intellectual advancement are on the whole taller, heavier and have the greater vital capacity. He found that the pupils of the John Worthy school for truants and incorrigibles were inferior in all the principal measurements taken and that the inferiority increased with age.

Kline (16) found in his study of truants that the mean height, weight and chest circumference was less than the corresponding measurements of public school boys in every instance except the age of ten, when they were equal in height and weight.

Believing that the correlations of Porter were essentially

correct, Goddard (13) compared the growth in height and weight of feeble-minded children with the normal. He found that for boys the feeble-minded were shorter and weighed less, age for age, than the normal. For the girls the situation with regard to height was much the same. For weight the girls seemed to deviate less from the normal than the boys. Having established the above Goddard turned his attention to the difference in the different grades of defect. He concludes that it is evident that the mental condition is correlated with the physical. The idiot he finds to be inferior to the imbecile physically. Size and efficiency go together in the long run. The cause that has acted to impair mind and brain has affected the entire growth process.

As the result of an extended study of physical growth and school progress, based on consecutive measurements at yearly and half yearly periods Baldwin comes to the conclusion that "If pedagogical age be accepted as a fair equivalent to mental development, the tall heavy boys and girls with good lung capacity are older physiologically and are further along in their stages of growth toward mental maturity as evidenced by school progress than are the short, light boys and girls."

On the other hand Wiazemsky (27a) concluded from a study of factors that influence growth that the less endowed surpass the more intelligent in their physical development. This is true especially for the beginning and the end of the period studied by him, that is, from ten to twenty years. The recent study of Arnold on Weight and School Progress brings out again the fact that the heavier children of a given age are to be found in the more advanced grades. His results are confirmed by the results of Hogue, whose tables are reprinted by him.

Historical Summary. Porter and Smedley in the United States conclude that the bright children are taller and heavier than the dull. These results are based on the age grade method of classification. Arnold and Hogue confirm the weight results. Baldwin using school marks comes to the same conclusion. On the other hand Gilbert found no constant relation and West a negative one. Both these investigators used the teachers' estimate of ability as the basis of classification. MacDonald, however, using the same method, confirmed the results of Porter and Smedley. Using spirometry Smedley found that successful children had larger vital capacity than unsuccessful. Gilbert found that correlation to be indifferent or negative, except that from ten to fifteen the dull children have the larger capacities. The investigation of Baldwin and the preliminary study of the writer confirmed Smedley's re-

sults. Wiazemsky measured the chest circumference and found good pupils to be superior at all ages except from twelve to thirteen and from fourteen to fifteen.

Height. Height is the most distinctly human of all the measurements, representing as it does a definite racial characteristic. Heredity preserves a definite norm which all its members tend to attain within rather narrow limits. So having the norm for the different ages established, height gives a fair index of the development of the individual. Bowditch pointed out that the taller individuals, that is, those in advance of the norm for their age reached the rapid growth period earlier. This fact has again been brought out recently by Baldwin. These taller boys and girls he says are the physiologically accelerated boys and girls. They complete their elementary school course earlier, he continues, and as a rule make higher grades than the shorter boys and girls whom he regards as physiologically retarded. If this finding holds as it certainly does for relatively large numbers then height in relation to the norm of a given age is a criterion of physiological age and these taller boys and girls have attained a greater proportion of their mature height. Growth in height is rapid in early childhood and falls to a minimum about ten or eleven. This period of retardation is followed by one of acceleration beginning with pubescence. Acceleration alternating with retardation is a general law of growth, true of the individual as well as of the group. Every study since Quetelet has shown the period of retardation from eight or nine to ten or eleven, followed by a period of acceleration lasting about four years. With girls this period of acceleration begins a year or two earlier than with boys and accounts for the fact that from eleven to fifteen in general, girls are taller than boys. Thus the data presented in this study are typical. But not only are the girls taller during pubescence but also at seven and nine, a fact which may be due to some accident of numbers or may show some variation of growth since the same fact is noted in the results of several investigators. As mentioned before, the pubescent crossing of the curve is due to the earlier rapid growth of the girl. Some investigators think that the comparison should not be one of attainment at a given chronological age but rather should be between the percentages of adult height attained at a given age.

Let us turn now to the analysis of the data on the basis of mental age. The accelerated boys are taller than the normal till twelve. At this age and all succeeding ages studied they are not so tall. On the other hand the retarded are

shorter than the normal at all ages studied except eight and thirteen, when they are also taller than the accelerated. Thus the accelerated are taller than the retarded at all ages except eight and thirteen. If we compare the accelerated and the retarded girls the former are taller until the rapid growth period begins at eleven. At this age they are surpassed by the retarded who remain taller until fourteen. The delayed growth of the retarded girl in the earlier years seems to be compensated for by the three years of rapid growth from eleven to thirteen inclusive. Thus we find retarded boys to be taller at thirteen and girls at eleven, twelve and thirteen. This conclusion is not in accord with Wiazemsky who found good pupils to be superior in height only during the period of rapid growth. The periodicity of growth is much more marked in the retarded than in either the accelerated or the normal. With the latter, growth is much more steady and uniform. With the retarded the earlier years mark a period of very little growth. This is followed by a period of acceleration perhaps shortened in time but compensated for by intensity. Some investigators think that this rapid growth can have only a harmful effect on the individual from the standpoint of the physical and the mental life. As to the cause of the extreme periodicity of growth we can not say. Some investigations indicate that this picture is usually accompanied by effects which follow harmful conditions, namely the precipitate growth and the delay of puberty. (See Table I.)

Weight. Unlike height, which when once gained cannot be lost, weight varies greatly, is easily lost and gained. It is an experimental datum as Montessori (19) calls it, a barometer, an index of the child's health deserving of the most careful study. Environmental factors as illustrated in McKenzie's studies, deprivation, fatigue, anxiety, worry, malnutrition, illness, all affect adversely the weight of the child. A careful study of the weight may not only reveal the effect of factors in the environment but may serve to reveal the strength or weakness of the child's organs.

As with height, growth in weight is not uniform but rhythmic. There is in general a slight acceleration in girls at seven and in boys at eight. The following period of retardation in growth reaches its lowest with girls at nine and with boys at eleven. At about eleven the period of rapid acceleration of weight begins and lasts about four years. In the present study the growth in weight follows the usual course. There is little difference between the sexes until twelve. Girls are slightly superior at seven and nine. The pubertal superiority begins at twelve. As with height this

superiority is due to the fact that the rapid growth period begins earlier with girls than with boys. The accelerated boys weigh less than the normal boys except at the ages seven, twelve and thirteen. Retarded boys are heavier than the normal at eight, twelve and thirteen. When compared with the accelerated the retarded are heavier at the ages of eight and thirteen.

With girls the accelerated are lighter than the normal at all ages except thirteen and fourteen. Retarded girls are lighter than the normal until eleven, then heavier except at thirteen and fourteen. Retarded girls are lighter than the accelerated at eight but heavier in all other groups presented. While retarded boys are lighter than the accelerated at almost all ages, retarded girls are heavier at ten and subsequent ages.

The gain in weight is not so uniform as the gain in height probably for the reasons mentioned in a preceding section. Nevertheless accelerated and normal show a rather uniform rate of growth until the rapid gain at puberty. With the retarded we have the law of compensation at work as in height. The rapid growth of puberty tends to bring both retarded boys and girls above the accelerated at this period, boys at thirteen and girls from eleven on. (See Table II.)

Vital Capacity. The development of the chest is of the greatest importance. No part of the body undergoes greater changes. Hastings speaks of the want of breadth in the infant chest. Woods Hutchinson writes of the widening of the chest in the animal series. The human chest is almost unique, he writes, in that its transverse diameter is the greater. This transformation from the narrow almost animal form to the more human adult form is destined to receive greater consideration in the future than it has in the past. The rate of transformation will give us another index of the rate of the maturing of the individual.

The circumference of the chest has received considerable attention especially in its relation to height. The general rule is that the chest circumference should equal half the total stature. This has been one of the determining marks for military fitness. It is generally conceded that the more the chest circumference exceeds half the height the greater is the vitality and the greater the ease with which the individual adjusts to the varying effects of the environmnt. The measurement of the chest must of necessity give some idea of the development of the lungs. These are the organs that furnish the means for the inter-communication between the blood and the oxygen which is so essential not only for all growth but for all functioning as well. The lungs are responsible for

oxygenating the tissues of the body and in this way aid in cellular metabolism. If the lungs are relatively small then the body is without that factor of safety, metabolism is probably slowed down and the amount of exertion under stress is limited. A large supply of oxygen stimulates interchange. The want of it reduces activity. For the growing person the rate of approach to maturity, the physiological age, is retarded. Two methods of measuring have been used by students of the mental and physical growth of school children, the chest circumference and spirometry or the measurement of vital capacity. Porter studied the girth of the chest of the school children of St. Louis and found that the bright children have a larger chest circumference than the dull. The results of Gratsianoff and Sach agree with Porter in this respect. Kline found the chest girth of truants to be less than that of public school children at all ages except at ten. Wiazemsky found good children, that is the bright, to be superior to the poor at all ages except twelve to thirteen and fourteen to fifteen. He also found that robust children were superior at all ages. Also those of good conduct were superior to those of bad at all ages except thirteen to fourteen and sixteen to seventeen. Not only did Wiazemsky point out the above but also the significant fact that the occupation reflects itself in the development of the chest. From the above it is safe to conclude that there is a correlation between school progress and chest circumference.

While there must, it seems, be a high correlation between chest capacity as shown by chest circumference and vital capacity the two are not synonymous. Other investigators have used spirometry. Spirometry only measures directly the respiratory capacity and indirectly the pulmonary capacity. Gilbert found that there was no constant relationship between mental ability and vital capacity until ten to fifteen when the duller children had the larger capacity. Smedley in his investigation found that the vital capacity was much greater in the children of higher school standing. Goddard has pointed out that the vital capacity of feeble-minded children is smaller than that of the normal. Montessori states that among children that are recognized as the brightest she has been able to recognize two categories, those who are exceptionally intelligent and those who are exceptionally studious. The former have better chest development than the latter.

In general vital capacity in its growth follows the same laws as weight, showing the same periods of retardation and acceleration. Practically all investigators have found that boys have larger vital capacities at all ages than girls. Bald-

win's study shows girls with greater vital capacity between thirteen and fourteen. The present study would add also the ages of seven and nine. On the basis of mental age the accelerated boys have better vital capacity than normal at all ages except eight and fourteen. The retarded are inferior to the normal except at eight, when they are equal, and at twelve. At no age do the retarded show a vital capacity equal to the accelerated except at eight. Accelerated girls are superior to normal at all ages except seven and twelve. The retarded are superior to the normal at thirteen and fourteen. At thirteen the retarded are superior to the normal but at no other age.

Thus accelerated boys have greater vital capacity than retarded at all ages except that of eight, when they are equal, and the same general rule is true of girls except for the age of thirteen. Again the same tendency toward a uniformity of growth is noticed for the accelerated and the normal. Also the same period of retardation in the earlier school years, followed by rapid growth, which is more marked with the retarded girls than with the boys. (See Table III.)

Growth, which is an exceedingly complex process, manifests itself in three laws studied by many investigators but especially discussed by Wiazemsky. First is the law of periodicity. According to this law, the growth of the organism is subject to accelerations and retardations. While this law is seen to an extent in all the groups studied it is much more noticeable in the retarded. It would seem that during the earlier school years some factor, or perhaps several is at work which tends to slow down the growth process. Baldwin, studying the taller and heavier children as a group found that the period of acceleration and arrest began and ended earlier with them than among those below the median height and weight. Then when development is arrested at any of its regular growth periods by unfavorable circumstances, there is a tendency for a later rapid growth to compensate for lost time. The brevity of the period of retardation is compensated for by the extent of growth and vice versa the slowness of the growth rate by the length of time. In the third place there is the law of correlation. The human body is wonderfully complex. If it is to grow and function properly there must be a proper correlation of its parts. The digestive system must be equal to the task of furnishing an adequate amount of nutritive material. The lungs must be large enough to supply not only the average need but also a factor of safety for the moments of intense effort. The heart and the arteries are responsible for conveying a sufficient amount of material to the growing

and functioning parts. Unless such a correlation exists growth can not be equal and uniform. Some parts must grow at the expense of others. Protective measures for the preserving of energy must arise. On this point in the absence of further investigation we can not speak. As the matter now stands, the brighter children are those who seem to have this balance or even an excess on the side of vital capacity. The other systems mentioned have not been studied in this connection.

On the basis of mental age, accelerated boys are as a rule taller and heavier and have larger vital capacities than the retarded, while with the girls studied the retarded excel in height and weight during the rapid growth period and also in vital capacity at the age of thirteen. This of necessity means that there are many groups of accelerated that are below the average of their age in the measurements mentioned. This was recognized by Porter and the investigators following him. It was pointed out by these that the small accelerated were taller and heavier than the small retarded.

If height and weight are to be considered as expressions of physiological age as many think, and the writer believes that this is true of the average, then it would seem that children must be differentiated into types. Then as a rule the taller and heavier for the type would be physiologically the more mature. But it is yet a question whether or not this would solve the problem. For one would have yet in classifying a child to determine whether it was a case of type or physiological retardation, in which case the height and weight would be the result of some unfavorable factor acting upon the growth process. Is there not some underlying principle which will harmonize the conflicting data? Not only the energy of growth but the energy of work hangs on the metabolic balance. With the production of work there must be consumption of fuel either of food or of body material. In work of course this consumption is greatly in excess over rest. Probably in no organ is the demand for quick change so great as in the brain. There is growing evidence that the oxygen consumption of the brain is greater than previously thought and it has already been shown that there is a direct relation between the rate of recovery from fatigue and the rate of transmission of the nerve current. In view of these facts it seems reasonable that Whipple's statement of the vital index is correct, that the vital index, the ratio of vital capacity to weight " expresses the balance between body size and the rate and completeness with which oxidation of the blood is or may be affected."

The vital index should it seems give a rough measure of the endurance of the subject and of his recuperative powers. The subject with the higher vital index would then do the greater amount of work. It was shown by illustration in the preliminary work that those children of a given age who were the farther advanced had the higher vital indices.

Kotelman in 1878 was the first to study lung capacity in relation to weight and pointed out the fact that lung capacity increased slightly faster than weight. This conclusion was confirmed by Vierordt. Bobbett in 1909 studied the vital index of Philippine children. Since then Pyle (22) has figured the vital index for Smedley's data showing that the vital index for boys is almost constant at 25 cc. per pound of weight and for girls 23 cc. until eleven. There is then a gradual decrease until fourteen. At this age the index is 21 cc. Baldwin also gives the vital index in his studies of growth.

Our method of classification permits the study of the vital indices of the different groups. At the ages of seven and nine the vital indices of boys and girls are practically the same. At all other ages boys have the higher vital indices. Compared with Smedley's data the vital index of the boy throughout is about the same. The girls do not show the progressive drop after the age of eleven. At the age of eight in our table the average vital index of the accelerated boy is slightly lower than that of the normal. But at no age is the vital index of the retarded as high as that of the accelerated. Consequently there is a marked difference between the vital indices of the accelerated and the retarded boys. With the accelerated girls the vital index is higher at all ages than that of the retarded. However at ten the retarded slightly surpass the normal. But as with boys there is a marked difference between accelerated girls and the retarded. Regardless of age the accelerated show a relatively high vital index while the retarded are relatively low. (See Table IV.)

There is undoubtedly a high correlation between the results of the Binet scale and the teacher's estimate, also between the teacher's estimate and the grade position. So classification on these bases should show the same differences in vital indices although not so great. For the purpose of determining, the vital indices were figured for the work of Gilbert at Yale and the study of Smedley. With Gilbert's study the bright, on the basis of the teachers' estimate, show the higher vital indices at all ages except those of eleven and twelve. The Iowa study does not give as high a correlation. Of the total number of ages studied by Gilbert at Iowa the dull show the lower vital indices in eight and the higher in the remaining

four. Smedley classified the Chicago children into two groups on the basis of the grade age position as follows, those at and above grade and those below grade. The at and above grade group shows the higher vital index at every age except eight and ten. It is to be expected that the difference will be greater in the upper grade, where there is a greater accumulation of retarded on this method of classification. The below grade girls have the higher indices at ten and eleven and are equal to the at and above grade group at thirteen. When compared with the at and above grade boys, the boys from the John Worthy school for truants show lower vital indices except at the ages of nine and twelve. (See Table IV.)

From the above comparisons, in spite of differences of classification, technique, etc., one fact stands out and that is that accelerated children, regardless of the method of classification, show at almost every age the higher vital indices. We believe that the vital index is much more closely correlated with acceleration and retardation than height, weight or vital capacity, and that it is a measure which will harmonize the otherwise conflicting data.

Is there any relation between a high or a low vital index and the development of the child? If it is shown that a relation exists, then the problem becomes an important one for education and hygiene. The vital index can be increased by training which decreases surplus weight and increases the vital capacity. This increase means a better aeration of the blood and, it would seem, an increase in metabolism which would show in endurance and resistance to fatigue or, in other words, in a greater output of work.

It will be objected that spirometry is not altogether a measure of vital capacity. This objection is not without foundation but we believe that the evidence at present shows or at least indicates strongly that the retarded children have smaller chests and presumably smaller lungs due, we believe, to a physiological retardation. It was shown by Porter that those children who were below grade had the smaller chests.

While the measurements of height, weight and vital capacity are of undoubted value they do not give a complete picture of child development. Growth is more than an addition of mass or stature. At birth the child is quite different from the adult in its body proportions. Its growth is an ontogenetic development passing from the form and proportion of the infant to that of puberty and then on to that of the adult. This ontogenetic development can best be traced by the indices of growth, that is, by the relation of weight to height, the height-weight index, by the ratio of sitting to

standing height and by the ratio of chest circumference to height. Not having in mind at the time of collecting the above data the question raised above, the measurements for tracing all these changes were not made, nor is there any single study which enables one to trace all these changes in the same group. However, data of those investigations in which the vital index differences have been shown give some idea of the relationships which we are seeking to establish.

The height-weight index " expresses the comparative solidity or robustness of the individual and other things being equal his general nutrition. There have been two methods of obtaining the height-weight index. The division of the weight by the height gives the proportion of mass for a given unit of height. The most important conclusion on the basis of this method is that the weight increases somewhat faster than the height. This method is held to be faulty by many because it is a comparison of a linear measure with a volume and the resulting indices do not show the transformations of the body as it approaches maturity. It is a matter of common observation that young children have a relatively large proportion of weight for their height, that is, are, as we say, plump. They become thinner before puberty and heavier afterwards. The above method does not bring out this fact. The method used in this connection is expressed by the following formula. The height-weight index equals one hundred times the cube root of the weight divided by the stature. There is a gradual decrease in the indices until just before puberty. From this time until about the age of seventeen the index remains rather constant and then begins to rise as the individual takes on weight, following the pubertal transition. An important study cited by Montessori brings out the fact that the height-weight index of the studious is lower than that for the non-studious. Also that the index is higher for the feeble-minded than for the normal. Consequently she thinks that the sole cause of the physical inferiority of studious children is cerebral fatigue.

Calculating for our own groups and also for Smedley and for Gilbert, the height-weight indices bring out the fact that there is a tendency for the retarded to show the higher indices. (See Table V.)

The second important index is that of the relation of sitting to standing height. This ratio may very well represent the physiological efficiency of the individual. In fact, Collignon spoke of it as the essential stature. This index also enables us to trace the rate of development of the growing child. In early childhood there is an exaggerated trunk length. The

vegetative life is then the most important. With growth this excess gradually decreases until it is least at puberty, following which there is a gradual increase in the excess of trunk length, a return as it were to the more childlike proportion. Thus growth in height until puberty is mainly due to growth of the long bones of the legs. As Godin pointed out, at puberty the lower limbs have a greater dimension in proportion to total height than at any other time. After puberty the proportion of the trunk for boys increases until about seventeen, after which the individual may grow in height but the proportion remains rather constant. With girls the proportion of the trunk continues to increase after this age.

The deviation from the norm of a given age represents in the growing child either a retarded or an accelerated development; and in connection with the other indices gives us a measure of the rate of approach to maturity.

A study of the Smedley groups not only bears out this generalization but shows a close relation between the rate of development and the vital index. Those with the higher, show the more rapid transformation, while the below grade are the retarded and show the lower vital indices. These differences are seen when we compare the retarded and the accelerated girls also with the two groups of the boys and again when we compared the at and above grade boys and the boys from the John Worthy School. (See Table VI.)

We do not have the data to show the relation existing between the ratio of chest circumference on the one hand and the vital index on the other. However retarded children have a smaller chest circumference than accelerated as was shown by Porter. There is a need of study of all of these relationships in the same group of children.

While no thoroughgoing conclusion can be drawn, yet as a general rule accelerated boys are taller, weigh more and have the greater vital capacity. Accelerated girls have the greater vital capacity but the retarded are taller and heavier during the greater part of the rapid growth period. With both the boys and girls the vital index of the accelerated is greater at all ages than that of the retarded. With weight the reverse is true. The retarded show a greater proportion of weight per unit of height than do the accelerated. There are, however, exceptions to this rule, but the general tendency seems to be for the accelerated to show the lower proportion of mass with the higher vital index, as it were a relatively low mass highly oxygenated. The opposite holds for the retarded. The study of the ratio of sitting to standing height brings out the fact that those children with the higher vital

indices are approaching maturity in advance of the low vital index groups, that is, are relatively more mature for the same chronological age.

Those children of a given chronological age who have the higher vital indices are then the more mature and test mentally higher than those with the lower vital indices. Consequently then compulsory school entrance at the age of six must mean that a large number of the entering children are not six physiologically or mentally and so are doomed to failure if the school maintains a fairly uniform standard of work. Many of them after marking time until they are sufficiently mature pass through the remaining grades without difficulty. Again the question is raised whether the two groups described as accelerated and retarded are not after all types in need of radically different treatment. With a classification on the basis of the mental age the physiological differences do not disappear. Although there is little evidence on which to base the opinion, the writer has been unable to escape the conviction that the low vital index group furnishes the majority of those who fail in the lower grades and also of those who are eliminated in the upper grades. This, however, is being made the subject of a separate investigation.

In conclusion the writer wishes to express his appreciation to the members of the staff of the Colorado Teacher's College Training School who made possible the collection of the data of this paper and to express his sincere thanks to President Hall and Dr. Burnham of Clark University, who, for criticism and suggestion, gave so generously of their time.

TABLE I

HEIGHT IN INCHES

Age	7	8	9	10	11	12	13	14	15
Boys	47.9	51.0	52.0	54.0	56.0	56.4	60.1	60.0	64.3
Girls	48.9	50.0	52.8	53.6	55.3	57.5	61.2	61.0	62.8
Boys									
Ac*	49.0	50.3	52.0	54.5	56.5	56.3	60.0	60.5	....
Norm	46.0	49.8	50.7	53.5	56.1	57.5	60.0	63.4	67.0
Ret	....	52.0	....	51.5	52.0	55.5	60.5	58.0	64.0
Girls									
Ac	49.0	51.0	51.8	52.5	56.0	56.0	60.3	63.0	....
Norm	49.0	50.5	53.5	55.0	54.7	57.8	59.2	59.3	62.0
Ret	....	50.3	....	52.5	57.0	57.5	62.8	61.7	64.3

* Ac., Accelerated: Those testing one year and above chronological age. Norm., Normal: Those testing at age. Ret., Retarded: Those testing one year and not more than three below the chronological age.

TABLE II

Weight in Pounds

Age	7	8	9	10	11	12	13	14	15
Boys	49.8	61.3	60.4	67.8	75.5	81.1	90.6	87.0	116.5
Girls	54.7	57.3	63.7	64.3	72.3	79.7	100.1	107.1	113.0
Boys									
Ac	51.0	61.0	59.4	69.6	72.6	82.2	91.3	84.5	....
Norm	46.5	61.0	61.7	71.5	78.3	77.0	89.0	93.0	137.0
Ret	....	65.0	....	59.0	64.0	82.0	94.5	82.3	114.0
Girls									
Ac	44.0	58.0	62.5	60.0	70.0	70.0	96.6	101.0	....
Norm	60.5	61.5	65.4	68.0	72.0	83.2	85.4	100.0	116.0
Ret	....	53.0	....	61.0	76.0	77.8	121.2	112.8	112.0

TABLE III

Vital Capacity in Liters

Age	7	8	9	10	11	12	13	14	15
Boys	1.24	1.53	1.50	1.76	2.01	2.18	2.34	2.15	2.98
Girls	1.23	1.30	1.59	1.64	1.77	1.90	2.36	2.35	2.63
Boys									
Ac	1.30	1.50	1.60	1.94	2.07	2.60	2.60	2.30	....
Norm	1.15	1.55	1.37	1.75	2.02	1.95	2.25	2.36	3.60
Ret	....	1.50	....	1.35	1.50	1.75	2.25	2.10	2.91
Girls									
Ac	1.20	1.53	1.63	1.80	1.90	1.90	2.47	2.80	....
Norm	1.30	1.45	1.57	1.63	1.66	2.40	2.06	2.25	3.00
Ret	....	1.00	....	1.50	1.60	1.72	2.65	2.38	2.50

TABLE IV

Vital Index

Age	7	8	9	10	11	12	13	14	15
Boys	24.9	24.9	24.8	25.9	26.6	26.9	25.8	24.7	25.6
Girls	22.5	22.8	24.9	25.5	24.5	23.8	23.6	21.9	23.3
Boys									
Ac	25.5	24.6	26.7	27.9	28.5	30.4	28.5	27.2	....
Norm	24.7	25.4	22.2	24.6	25.7	25.3	25.3	25.4	26.2
Ret	....	23.1	....	22.9	23.4	21.3	23.9	23.5	25.5
Girls									
Ac	27.3	26.0	26.2	30.0	27.1	27.1	25.6	27.7	....
Norm	21.5	23.6	24.2	23.9	23.1	24.5	24.2	22.5	25.9
Ret	....	18.9	....	24.6	21.1	22.1	21.9	21.1	22.3
Smedley Boys									
At and above grade	25.1	25.8	25.0	25.3	25.4	25.5	25.0	26.3	
Below grade	26.3	24.9	25.5	25.0	24.3	25.2	25.0	24.7	
John Worthy School	...	26.1	25.0	24.4	25.7	24.8	25.1	24.5	

TABLE IV—*Continued*

Girls								
At and above grade	23.0	23.3	22.6	22.4	21.8	20.6	20.6	20.6
Below grade.....	22.7	22.9	23.4	22.5	21.1	20.6	20.3	19.1
Gilbert—Yale Study								
Bright..... 22.1	21.9	21.8	21.4	21.7	20.8	22.6	19.4	21.8
Dull..... 20.8	20.1	21.1	19.3	21.9	21.7	18.9	17.3	19.9

TABLE V

HEIGHT-WEIGHT INDEX

Boys									
Age.....	7	8	9	10	11	12	13	14	15
Ac.....	22.9	23.9	22.7	22.6	22.3	23.5	22.7	21.8	....
Ret.....	....	23.3	....	22.7	23.3	23.5	22.6	22.7	23.0
Girls									
Ac.....	21.9	22.8	23.0	22.4	22.1	22.1	23.2	22.4	....
Ret.....	....	22.7	....	22.7	22.3	22.9	23.8	23.6	22.7
Smedley Boys									
At and above grade	23.8	23.1	23.2	23.2	23.1	23.0	23.0	22.9	
Below grade.....	23.5	23.5	23.5	23.3	23.3	23.1	22.9	23.2	
John Worthy School	....	23.5	23.9	23.6	23.6	23.5	23.4	23.4	
Girls									
At and above grade	23.4	23.1	23.1	22.8	22.8	22.9	23.1	23.3	
Below grade.....	23.5	23.2	23.4	22.9	22.9	23.0	23.1	23.1	
Gilbert									
Bright.....	23.4	23.0	23.2	22.4	22.8	22.7	22.8	22.1	
Dull.....	23.6	23.3	22.9	21.6	22.8	22.8	22.4	22.8	

TABLE VI

RATIO OF SITTING TO TOTAL STATURE

Smedley Boys								
Age.....	8	9	10	11	12	13	14	15
At and above grade	54.8	54.0	53.5	53.1	52.5	52.1	52.1	52.0
Below grade.....	55.1	54.7	53.8	53.3	52.9	52.2	52.2	51.8
John Worthy School	....	53.7	54.5	53.6	53.4	52.6	52.9	51.0
Girls								
At and above grade	53.9	54.0	53.5	53.1	52.7	52.6	52.9	53.4
Below grade.....	55.4	54.3	53.8	53.4	53.1	52.8	52.1	53.1

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A BRIEF SURVEY OF RIGHT- AND LEFT-HANDEDNESS[1]

By Laura G. Smith, Clark University

Every known language contains terms for right and left, by which it is clearly shown that in all times the idea of "rightness" or dexterity, has greatly outweighed that of "leftness," or awkwardness in value. It is needless to dwell here upon the various superstitions of former times regarding left-handedness. A detailed account of such ideas is set forth by Hertz in his treatise on Religious Polarity, dealing with the traditions of the Maori tribe of New Zealand. Our custom of wearing the engagement and wedding rings on the left hand is traced back to their belief in dispelling all evil influence and temptation connected with it, as the left side is profane, the right, sacred. Daniel Wilson in "The Right Hand: Left-Handedness" also presents many biblical examples of the usage of these two members, all of which are very interesting, though not of scientific value.

As to the origin and practice of right- and left-handedness many conflicting views have been set forth. I shall group these opinions according to the seven following theories:

I. The Hand and Foot Theory

This theory is upheld by Charles Bell who declares right- and left-handedness to be of the same order as right- and left-footedness. Workman has upset this view by the fact that a "spade foot" is as likely to be left as right in a right-handed person, and vice versa; and that a boy always hops on his "spade foot." I confess I cannot follow either line of argument. A boy is usually over his hopping period before he uses a spade to the extent of habitually guiding it with one foot more than the other. We find it convenient to use both feet whether we are right- or left-handed.

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II. The Hand and Eye Theory

Gould considers that right-handedness originates in right-eyedness. Whichever eye first develops more than the other in strength, governs the hand on that side of the body, thus causing the preferred member. He considers ambidexterity nonsensical, and declares it to be the hobby of fanatics. It would mean playing on two pianos instead of one; fingering on the violin first with one hand, then the other; and would require separate road laws calling for passage to the left one day, and to the right, the next. He excuses the exception of the English road rules on the score of the once filthy streets and poor conditions generally; for as is said of the English custom:

> "If you go to the left, you are sure to go right;
> If you go to the right, you go wrong."

He suggests that this extreme awkwardness of the English may account for the many accidents in the navy.

Gould offers as a proof of right-eyedness the right-hand position of the railway engineer. To be sure, the engineer's position is at the right, but does this mean that he makes use merely of his right eye, or that he is concerned with what passes to the right, only? From his seat he has a clear view of the entire track in front of him, and takes his signals from the left as well as from the right. All right-handed engineers are not right-eyed; and neither is the left-handed engineer at a disadvantage as regards his left eye, because he must sit at the right side of the cab.

The driver of a carriage or wagon usually sits on the right half of the seat, perhaps from habit, or more naturally, for convenience if he steps onto the vehicle from the sidewalk, as he does in most cases. If, however, he steps onto his delivery wagon from the left side, he is quite likely to take his position at that end of the seat, or in the centre. Few will take the trouble to pass over to the right, unless from strong force of habit.

The earliest models of the automobile would tend to bear out Gould's theory of right-eyedness as applied to the engineer, since the first drives were all right ones. Supposing such an argument to hold, it would prove that all early models were made exclusively for right-handed people, and that the improved models of to-day are constructed for their left-handed friends. Perhaps Gould would not include the right and left drives of the automobile in his arguments for right- and left-handedness, but it seems in consistency with the subject.

The manufacturers argue not on the basis of eyedness or handedness, but convenience. Road rules call for a right

facing of machines, hence, in order to enter the car from the sidewalk instead of walking around to the opposite side and entering from the oft-times muddy street, the drive must be a left one.

A different phase of this subject is brought to light by Stevens in his papers on Peculiarities of Peripheral Vision. His disc tests prove that an object in the right half of the field of vision appears larger than an exactly similar object occupying a symmetrical position in the left half of the field of vision. This result is, with some exceptions, universal for right-handed observers. He proves the tendency to relationship between right-handedness and the enlargement of the right disc, and left-handedness and the enlargement of the left disc.

Later, Stevens and C. J. Ducasse, in their report on The Retina and Righthandedness, give a summary of the results of their tests as follows:

I. In general it may be said that the right half of an extent in the field of vision is overestimated.

II. This overestimation holds true for both right and left eyes.

III. The extent which is overestimated forms its retinal image upon the left corresponding halves of the two retinas.

IV. The left corresponding halves of the two retinas are connected exclusively with the left hemisphere of the cerebrum.

V. By reason of the fact of a marked difference in the space sense of the two halves of the retina, those objects in the right half of the field of vision, by appearing larger attract the visual attention which in turn leads to grasping movements of the right hand. The hand thus formed by earliest experience acquires a special skill which causes it to be used in all manual acts requiring the greatest precision.

Max Meyer's view is a contradiction of the previous one. He says that left-sidedness of the infant is in every respect of the same nature as right-sidedness of the adult. By "infancy" he means the period preceding speech. If the left cerebral hemisphere, which serves such complex functions as speech, reaches maturity only during the second year, it is safe to say that during the first few months of life hand movements are predominantly controlled by the right brain which serves simpler functions and probably matures at an earlier period. If this is true the attempt of H. C. Stevens to explain right-handedness, fails. Meyer claims that the superiority of the sense of sight on the right half of the field of vision, which Mr. Stevens has proved, is not the cause but

rather the effect of right-handedness, unless both are to be regarded as the effects of a common cause.

According to Meyer, children who in the first stage of life are left-handed, become right-handed when the speech centre becomes active, and vice versa. This implies that the great majority of children during the first year or so are distinctly left-handed, which we know is not the case. He fails to account for infants who are thoroughly left-handed and remain so throughout life.

With a view to discovering whether either right- or left-handedness is due to the predominance of one eye over the other, the following questionnaire was submitted to Perkins Institution and Massachusetts Institution for the Blind, and the New York State School for the Blind:

1. Name and age.
2. Do you write with your right or left hand?
3. Were you taught to use this hand?
4. Do you read with your right or left hand?
5. Were you taught to use this hand?
6. With what hand do you use the following: (a) hammer? (b) scissors? (c) jackknife? (d) ball-throwing?
7. Were you taught to use this hand?
8. What left-handed relatives do you know about?
9. Were you born blind?
10. If not, at what age did you become so?
11. What was the cause?

* * * * * * * * *

Pupils with deformed or maimed hand or arm are excused from answering these questions.

If the name is withheld, please state sex.

The returns of two hundred pupils show that 10% of the boys and 11% of the girls are natively left-handed; while 5% of the boys and 16% of the girls are of the mixed type, a few being practically ambidextrous. 50% of these pupils were born blind, about 30% became so within the first six months, while those remaining lost their sight, partially or entirely, between six months and eighteen years.

Since many cases of right- and left-handedness are found among those born blind, it would seem that we cannot trace the preference of one hand over the other to any predominating influence of one eye, as Gould believes. The mixed type is found for the most part among those born blind, which shows what non-interference may do. The blind child, if let alone, will use whichever hand is the more natural or convenient in any case; in other words, prejudice of custom plays no part in his hand motion.

Many interesting cases are found in these schools. Two girls read braille with the right hand and line type with the left. One girl who is right-handed in everything else reads with her left hand and keeps place with her right. She was taught the opposite but finds this way more speedy. Another right-handed girl does likewise, not for speed, but because she has better touch in her left hand. A girl who became blind at two months uses her right hand for everything but hammering. She was not taught to use the hammer, which she holds in her left hand. As a hammer is usually held in the stronger hand, this example seems to show selection by nature as opposed to education or training. Two girls who were taught to use the easier hand, read with their left, though the right hand is employed in all other cases. A girl who became blind in early childhood is purely ambidextrous. She uses either hand well in any case. A similar case is found in a partially blind girl. Several of the right-handed boys read with their left hand, or either, immaterially. One throws a ball with his left hand. Five right-handed boys, who were born blind, throw a ball with the left hand. Two of these boys use the left hand in reading. A left-handed boy, who became blind at three years, is right-handed in ball throwing.

Fully one-third of these pupils write back-hand or have a strong back-hand tendency. Among this number are found all cases—left- and right-handed born blind, left- and right-handed becoming so, and the mixed and ambidextrous types.

III. Circulation Theory

Wilson in summing up the various views of right- and left-handedness, states in brief the following: 1. The general vigor, and immunity from disease appear to be transferred to the left side of left-handed people; and this has naturally suggested the theory of a transposition of the viscera, and the consequent increase of circulation thereby transferred from one side to the other. "This is an untenable theory as the relative position of the heart is easily determined in the living subject."

2. A greater flow of blood to the left side is traced to the reverse development of the greater arteries of the upper limbs. This idea is more generally favored.

Barclay's contention as stated by Buchanan reads: "The veins of the left side of the trunk and of the left inferior extremity cross the aorta to arrive at the vena carva; and some obstruction to the flow of blood must be produced by the pulsation of that artery. All motions produce obstruction of the circulation, and obstruction from this cause must be more

frequently produced in the right side than the left, owing to its being more frequently used. But the venous circulation on the left side is retarded by the pulsation of the aorta, and therefore the more frequent motions of the right side were intended to render the circulation of the two sides uniform."

Wilson considers this a curious idea as it traces right-handedness to the excess of a compensating force for an assumed inferior circulation pertaining naturally to the right side.

Hyrtl thinks that ordinarily the blood is sent into the right subclavian under a greater pressure than into the left on account of the relative position of these vessels; that in consequence of the greater supply of blood, the muscles are better nourished and are stronger; hence the right extremity is more used. In cases of reversed condition, left-handedness is occasioned.

IV. The Weight and Equilibrium Theory

Buchanan's early theory is based on the preponderance of the liver and lungs on the right side; that the right lung is the larger, having three lobes, whereas the left has only two; that the liver, the heaviest organ of the body, is on the same side; and that the common centre of gravity of the body shifts more or less toward the right. He fails to account for the normal deviation from the natural action of the body.

His modified opinion is a Theory of Equilibrium by which he claims the following variations: (1) The centre of gravity above the transverse axis, with its accompanying right-handedness.

(2) The centre of gravity corresponding with the transverse axis, which he assigns to the ambidextrous.

(3) The centre of gravity below the transverse axis, causing left-handedness.

Struthers contends that the centre of gravity depends upon the weight of the viscera. The deviation from this centre is the cause of right- and left-handedness.

V. The Hand and Brain Theory

In 1861, Broca definitely assigned the posterior part of the third frontal convolution of the left hemisphere as the seat of articulate speech in right-handed people, the opposite holding for the left-handed.

Gratiolet attributes right-handedness to the early stages of foetal development in which the anterior and middle lobes of the brain on the left are in a more advanced condition than those on the right side. Hence, the right side of the body is

better supplied with nervous force than the left; and therefore the movements of the right arm precede those of the left.

Wilson's answer to this is given in the proof furnished by a patient of the Provincial Asylum at Toronto. This man was so inveterately left-handed that he was placed on the extreme left of his company in the army and allowed the exceptional usage of firing from the left shoulder. At death his brain was removed and weighed, showing the preponderant weight of the right cerebral hemisphere. Hence, left-handedness is an exceptional development of the right hemisphere of the brain.

That some people consider right- and left-handedness to be controlled by the position in which a child is carried, is expounded by Baldwin and at once refuted. This would prove, he says, that a right-handed mother or nurse would cause the child to become left-handed; and, of course, such is not the case. His child showed no discernible preference for either hand from the fifth to the ninth month, so long as the objects were within easy reaching distance; but when violent muscular exertion was required it was always made by the right hand. When deviating to the left the right hand was used. Up to this time the child had not learned to stand or creep; hence, the development of one hand over the other is not due to a difference in weight between the two longitudinal halves of the body. Neither had the child learned to speak or to utter articulate sound with much distinctness; and so, right- and left-handedness may develop while the motor speech centre is not yet functioning. The use of the right hand carried over to the left side shows that habit in reaching does not determine its use. Baldwin believes that right-handedness is due to the difference in the two half brains, reached at an early stage in life; that the promise of it is inherited; and that the influences of infancy have little effect upon it. However, disuse or the cultivation of the other hand may diminish or destroy the disparity between the two. This inherent brain-onesidedness accounts for the association of right-handedness, speech and music faculty.

Questions 1, 2, 3, 6, 7 and 8 of the questionnaire already given were sent out to determine whether left-handedness is common among people of impaired speech, to the Lewis, Lamb and Northwestern Schools for Stammerers.

The returns from these schools show that of 36 girls, 3 are natively left-handed; of 80 boys, 5 are natively left-handed. Most of these subjects are now partly right-handed; and it is highly probable that the others have also had their hand motion tampered with. This high per cent of left-handedness among

stammerers seems to prove the hand and brain theory: if hand motion is interfered with before speech is established the result is quite likely to be stammering or impaired speech.

In addition to the questions sent out to stammerers the following were submitted to the Ohio State School for the Deaf:

Do you talk with your right or left hand? Were you taught to use this hand?

Were you born deaf?

If not, at what age did you become so?

What was the cause?

Out of 500 returns, 78% of the girls, and 68% of the boys are right-handed; 3% and 4% respectively are left-handed; and the remaining 19% of the girls, and 28% of the boys are ambidextrous in talking and at least one other action.

Of these pupils 70% were born deaf or became so before three years.

We have no way of detecting in sign language whether interference with natural hand motion affects the speech centre while it is functioning, or not; but the great ambidextrous tendency seems to point to a freer hand motion in the absence of speech. More freedom of motion is granted in the sign language than in penmanship. Several left-handed pupils according to instruction write with the right hand, but talk with the left.

VI. The Bilateral Asymmetry of Function

The bilateral asymmetry of function, according to Hall and Hartwell, is shown in every organ, the most familiar asymmetry in both form and function being that of the hands and arms. Dual function is well represented by the right and left brains: one of which is nearly always superior to, and controls, the other. One brain may be insane and be counterbalanced by the other brain.

The result of accurate measurement of the bilateral asymmetry of function, so far as applied to the arms and hands shows that the preferred hand makes the greatest excursion. The test of the hearing power shows the reaction by the stronger or preferred side to be greater than that made by the nonpreferred. Dynamometer tests show that the preeminence of the preferred hand is not in skill alone, but in exerted force as well. A maximal clenching movement by one hand is weak if at the same time a like maximal movement is made by the other hand. The failure of an attempt to repeat the standard submaximal clenching movement with both

simultaneously, instead of with one, indicates summation in repeated submaximal movements. The attention, so far as controlled by fixing the eye on one hand, has power to intensify the maximal energy of the clenching effort of the hand to which it is then directed. Attention seems to have more power over the right hand than over the left; but, if fixed on the left, commonly causes its maximal power to develop slightly in excess of the right.

Van Biervliet also favors the theory of asymmetry, even to the extent of expounding Hassen's proof of the asymmetry existing in the Venus of Milo. He asserts that in the right-handed person the right hand is the stronger, as are also the right eye and ear, and that the skin covering the right side of the body is more sensitive than that covering the left. The opposite holds in left-handed people. His experiments on two hundred subjects show that the optic, acoustic, tactile, olfactory, and gustatory motor nerves are all keener on the right side in right-handed people. He further states that in the right-handed the right nostril is the larger.

Van Biervliet says that right- or left-handedness is due to a mechanical cause coming from the beginning of embryonic life, and is not directly hereditary. He does not believe in ambidexterity, arguing that one member is always more developed in force than the other.

In direct opposition to the above theory is the one furnished by Toulouse, stating that in the great majority of cases subjects have olfaction as well as feeling and perception more developed to the left. Olfactory asymmetry means proficiency of the left nostril since this organ is in relation with the left hemisphere which commands sensorial superiority. Right-asymmetry or right-brain is left-handedness or ambidexterity.

VII. The Ulna Theory

W. Franklin Jones has just devised an instrument to ascertain whether a child should use his right or left hand. It is a form of brachiometer and may be used even with new-born infants. A child should be taught to use the arm having the longer ulna. He claims that in 96 cases out of 100 the ulna is longer in right arms. Out of 10,000 brachiometer tests he has discovered that 417 children were born left-handed, while 9,853 were born right-handed. 4% of the race are left-handed, while 96% are right-handed. 1% of all left-handed are shifted by deliberate interference. The many cases of feeble-mindedness and stuttering that he has met make him fear the transfer from one hand to the other. It is easy to return an individual to his birthright so far as the arms are concerned, he says.

A little practice will be sufficient to develop skill in the arm which nature intended to be used; and what nature intends in the case of left- or right-handedness should be followed to the letter.

In making the test Jones relies to a great extent upon his measurement of the 'ulna plus,' that is, the length of the ulna plus the length of the hand to the middle of the knuckle. This measure is used because it is more easily determined than the length of the ulna alone.

His returns seem to me to confirm the Hand and Brain Theory with the additional discovery of the 'ulna plus.'

Is the brachiometer test of practical value? Supposing the solution a true one, just how is it to benefit mankind? Nature will surely assert herself if allowed to do so; and, if interfered with, the brachiometer will be of no assistance unless laws are enforced forbidding interference in hand motion. It is not that people are ignorant as to whether a child prefers his right or left hand, but that they are bound he shall use his right one irrespective of his choice in the matter.

Observations of Hand Motion

Mrs. Woolley's observations of her baby's hand motions are rather significant. The first week of the seventh month the left hand was preferred, but after that the right predominated steadily, though at times either hand was used. In the eighth month the child learned to wave "Bye Bye" in connection with starting for a ride. The nurse in taking her out of the cab always carried her on the left arm, leaving the baby's left hand free; and as a result the child learned to wave her left hand. Later, either hand was used for this purpose, and finally the right hand entirely. In other pursuits the child used the right hand almost as exclusively as the adult. During the ninth month right-handedness began to be apparent. Mrs. Woolley declares the theory of the speech centre and right-handedness proved in this case, as the use of the right hand predominated when the child began to babble syllables.

Major's child at times preferred the right hand, then again had no preference for either, until in the twelfth month when a slight preference for the left hand began to appear, increasing rapidly until the child was clearly left-handed. The left movement was broken up at this time, so either as a result of training or natural tendency, the right hand was used more and more until in the second year the boy was decidedly right-handed.

Major questions what would have resulted if the child had been allowed to continue without interference or training. He

wonders whether children are natively either right- or left-handed which no amount of training can change; whether it is a matter of training; or if some children are ambidextrous but will develop right- or left-handedness under training.

Dearborn's little girl furnishes an interesting and varied program of hand motions only a few of which I shall state here. The fifth day of her life she used the right hand as much as the left though before this she had shown signs of left-handedness.

168th day she was very left-handed; 303rd day she was right-handed; 358th day ambidexterity played an important rôle; 595th day on, the right hand predominated.

Dearborn concludes that "the left side of the body seems both more reflex and somewhat more precocious than the right side. It seems to be more distinctly the mechanical implement of the organism's will while the right side is still largely reflex."

Ambidexterity

The late Sir Daniel Wilson was an artist of considerable ability. He was natively left-handed but through education cultivated the use of his right hand thus becoming ambidextrous. Much of his artistic work, however, was done by the preferred hand. As one enjoying both sides of the situation, he makes in his book a hearty plea for ambidexterity.

Henry Jones Macnaughton says: "As in the instance of polarized light, molecular arrangement in the brain may account for the freedom of the right hand over the left." He maintains that there is nothing discernible of an organic nature in the cortex of either hemisphere of the brain to explain any functional difference or superiority of one over the other. Man was originally endowed with a dual psycho-motor co-operating capacity of brain and hand—simultaneous or alternating. The brain is a dual organ and each hemisphere is capable of independent action. That a great coördination exists between speech and writing is clearly shown in pathological cases such as aphasia, in which the understanding is clear, but the patient is unable to convey his ideas in speech; amnesia, when there is confusion in recalling words and in applying the correct ones; and in agraphia, when the person may be able to express himself in language and yet be unable to write the words he wishes to use. Such cases of pathology are found but seldom in left-handed or ambidextrous people, who, by education or custom, are strongly influenced to use the right hand largely, hence working the left as well as the right hemisphere. These diseases are often successfully treated by compelling the patient to use his non-preferred hand and

thus bring the latent force of the accompanying brain into play Aphasia, according to one estimate, is, in fourteen out of fifteen cases, a disease of the left brain. This is decidedly an argument for the cultivation of both hands.

Macnaughton heartily favors the acquisition of simultaneous, two-handed writing, drawing and technical work, arguing that ambidexterity requires will power and control, concentration of mental effort, and contributes to the formation of character and intellectual growth. Man's intelligence cannot be bisected.

The nascent or developing period of the hand centre probably extends from the end of the first year to the end of adolescence, but the most active period is from four to fifteen years, after which time the centre becomes comparatively fixed and stubborn. During this period of development any forceful change from left to right, or vice versa, may result disastrously, causing, for instance, neurotic disorder, impaired speech such as stammering or stuttering, or indeed, complete imbecility. Neurasthenia and *neuro-mimesis* he claims to be caused by work taxing to the utmost one side of the brain and body. Simultaneous writing and ambidextrous motion in general would guard against all such diseases.

Schuyten also advocates the symmetric education of the different parts of the body, thus doing away with atrophy.

Lueddeckens affirms that at the beginning of embryonic life the symmetry of the organs is complete: even the vascular system is absolutely symmetrical from the heart to the veins and capillaries. The unequal development of the vascular system comes with the inequality of blood pressure which is stronger on one side of the head. Right-handedness is the result of the high blood pressure in the left head—where cerebral hemorrhage is most often found.

Another strong advocate of ambidexterity is Varia Kipiani. She says that the child at the beginning of life is ambidextrous; but this natural tendency is destroyed by educators who insist upon unilateral growth. Many types of tic, St. Vitus Dance, professional cramp and neurosis are the result of occupations in which unilateral muscular motion is in play. She considers that excess of unilateral cerebral, asymmetric work frequently disequalizes the nervous system of the school child from ten years of age to puberty; and is thus responsible for neurasthenia, chorea, St. Vitus Dance and the many cases of tic met with in school life.

As an argument for ambidexterity many writers cite instances of left-handed or ambidextrous nations. According to Pliny, the Gauls in their religious rites, contrary to the Roman custom, turned to the left. The Scythians, noted for strength

and valor of conduct, were ambidextrous. The Ancient Egyptians show in their works an inherited evidence of a prevailing ambidextrous faculty. A large proportion of the Persian workmen of to-day are ambidextrous; and among them the left hand is commonly used for signing letters or documents. By far the most striking example of ambidexterity among modern nations is that of Japan. There ambidexterity is taught in the schools and practiced in all the arts. The trait dates back to the remotest history of the race, and the gift is equally possessed by both sexes. Japan of all modern nations exhibits the most wonderful craftsmanship and manipulative skill, as is shown by originality in design; delicate carving in ivory; marvelous lacquer and gold ornamentation; beautiful inlaying of woodwork as also of gold and silver; unsurpassed embroidery and lace-work; tortoiseshell and silver enamel; and copper casting.

The ambidextrous and left-handed are proud to claim in their ranks these well-known men of talent: Michael Angelo, Leonardo da Vinci, Holbein, Landseer, Mozzo of Antwerp, Amico Aspertino, Ludivico Congrago, Sir Daniel Wilson, and Sir Baden Powell.

It is quite generally agreed that the percentage of left-handed people is two in one hundred. Jackson's investigation proved that 3% are incurably biased to left-handedness; 17% to right-handedness; while the remaining 80% are normally ambidextrous.

My own investigation of three public schools however showed that of the entire 2,055, 4½% of the girls, and 5½% of the boys are left-handed in practice. No doubt if the natively left-handed were to be added the percentage would greatly increase.

Is left-handedness increasing or decreasing?

This question is duly considered by Romaley who terms the left-handed person a Mendelian recessive. In a family containing a left-handed child perhaps neither parent is left-handed, nor has any ancestor for a number of generations been so affected. Such a condition probably exists in about one-sixth of the population. Left-handedness among parents is greatly underreported as the number of left-handed children is twice that of left-handed parents. He concludes thus: "Recessive mutants, unless of inherent weakness in some respect, must tend to increase in number at the expense of the originally dominant right types."

To determine the relation of left-handedness to general intelligence and character questions were sent out which brought me most deplorable returns.

500 reports from the Trenton State School for Girls, the Hallowell State School for Girls, the Shirley Industrial School for Boys, show that 11% of the boys and 6½% of the girls are left-handed. This seems to agree with the old idea of wickedness accompanying left-handedness. Notice, however, that it strongly disagrees with the former belief that this wickedness prevailed in the feminine gender. It is almost 2:1 against the boys.

200 returns from the Rhode Island and Maine Institutions for the Feeble-Minded show that 11% of the girls, and 8½% of the boys are left-handed. 4% of the girls, and 5% of the boys, are ambidextrous but prefer the right hand.

Does this not prove that there are many more cases of feeble-mindedness than we usually credit? Here, education has probably had no part, hence the native motion has prevailed.

The ambidextrous tendency seems to be a thoroughly native one.

Yet we find left-handedness well represented in all walks of life; the highest scholarship and honor lists include left-handed people. Then, too, many a brilliant so-called right-handed person must cast his die with the natively left-handed if real facts be known. He has been so well educated in the use of his right hand as to make it appear a natural one. Hence, data on the left-handedness of adults are quite likely to be faulty.

Left-handedness is viewed by many as little short of an affliction; and many of the so-afflicted must be often humiliated and at times seriously injured by the coercive methods used in breaking up this natural motion. We do find extreme awkwardness in connection with left-handedness, but is right-handedness entirely free from this condition? I think if we fairly examine the case we find that for every ungraceful left-hand motion may be found a proportional number of awkward right-hand acts. Sinistrality may be dextrality at the same time, and vice versa. Yet, any natively left-handed person I feel, greatly appreciates a right-hand training. He is thereby enabled to comply with the rigid rules of polite society, and still use his stronger or preferred hand for exceptional cases.

The destruction of native left-handedness must sometimes result in the loss to the world of a talent concealed in that paralyzed member.

Fine penmanship is found among left-handed subjects who are properly trained and have adequate practice, which, indeed, is necessary for good right-hand script. Are instructors

of penmanship, especially in the grammar grades, wise in compelling the use of the right hand even in the most stubborn cases of left-handedness? May they not be largely responsible for the many nervous disorders found in their little victims?

Many every-day acts call properly for ambidexterity or left-handedness. The manipulation of most musical instruments is a two-handed one; and the piano player calls for left- more than right-hand motion. According to the position of door knobs the hand used on entering is not that which should be used at the exit. Rowing often requires a two-hand motion as does sculling, also. Many accidents occur on the railroad and street railway which might be avoided if people would only learn to use their left hand instead of their right, when stepping off the car. The right hand grasps the handle of the seat or car, and hence the body is turned toward the right in such a way that the person steps off backwards. If the car is in motion he is thrown upon the back of his head. When the proper hand is employed the body swings out from the left hand, and the person faces the direction of the car. Then if he steps off while the car is in motion he may either run forward until his equilibrium is maintained, or simply be cast forward, in which case his head will not be in immediate contact with the pavement. Men's coats button to the right hence calling for a right motion; while women's coats have an opposite buttoning system calling for left-handedness. It is interesting to notice the conflicting movements involved in this matter-of-fact performance. You will see an apparently right-handed man deliberately decline the convenience made for him, by using his left hand. Then, again, a left-handed woman will button her coat with the right hand. Many people use the two hands in buttoning; but the majority, whether right- or left-handed, follow the law set for them—the men, right; the women, left.

In conclusion, the following data which do not entirely agree with commonly accepted statements as to left-handedness, may be once more stated for emphasis: As against the usual statement that 2% of the population are left-handed, my returns from 2,055 school children show that 4½% of the girls and 5½% of the boys are left handed; out of 500 delinquent children, 6% of the girls and 11% of the boys; out of 200 feeble-minded, 11% of the girls and 8½% of the boys; out of 500 deaf, 3% of the girls and 4% of the boys; and out of 200 blind, 11% of the girls and 10% of the boys.

The high percentages of the blind, feeble-minded and delinquent are especially striking and call for further study and explanation.

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WHY CLASS WORK IS OF LIMITED VALUE IN THE TREATMENT OF STUTTERING

By Mabel Stevens

Since stuttering usually appears in childhood and prevents a pupil's good work in the public schools, new departments are being opened and classes are being formed there to meet this condition.

To change the stutterer's speech to normal is a praiseworthy effort; to transform the stutterer himself is to reach the root of the trouble. It is the opinion of eminent authorities that the latter duty cannot be thoroughly performed by means of class-instruction. The idea of such means as sufficient, springs from regarding the stutterer as a pupil rather than a patient, and his affliction as a bad habit to be broken, instead of a disease to be cured. This attitude is fundamentally wrong. Fortunately we are rapidly outgrowing it.

Even after these patients are cured, they must be thought of as convalescents, and treated with tender consideration for some length of time. Under no circumstances should a former stutterer be subjected to a rigid examination or test for speech-defects, thus practically saying to him: "*You could not speak properly. Can you do so now?*" To insist on such a proof that he has "learned his lesson," as popular conception would express it, may have the effect of re-awakening the old difficulty.

Dr. Emil Fröschel, of Vienna, declares that if the stutterer enters an institution, the treatment should nevertheless be strictly individual "*streng individualisierend.*" This is next to impossible in any public school. When there are enough applicants to warrant engaging a special teacher, then first from point of numbers and second from lack of time, the assistance cannot be primarily personal. The Chinese custom of having a teacher for each scholar would be the ideal arrangement. The matter of expense alone would prohibit that, however. Thus it will remain forever true that the State cannot make the best provision for these unfortunates, but only the *second* best.

In many cases the permanent cure of stuttering is found to be conditioned upon "*a readjustment of the subconscious.*" The patient's state of mind toward life in general, and his im-

mediate environment in particular, is quite peculiar. Therefore in order to secure satisfactory results, correction of character must be carried on simultaneously with the correction of speech-defects. This leads us to the true conclusion *that speech-defect and character-deviation are closely connected.*

Dr. Wilhelm Stekel, of Vienna, predicts that psycho-analysis will be the method of the future for the treatment of stuttering; for the reason that only psycho-analysis probes to the seat of the trouble.

We have referred to stuttering as a disease. Its symptoms have been described by many physicians, and methods of treatment have differed in various ways. In the last analysis it seems justifiable to speak of stuttering not only as a disease with symptoms, but as itself a symptom—*a symptom of emotional conflicts and repressions,* stuttering is the expression of a psycho-neurotic state whose basic element is embarrassment, or fear—with its counterpart, desire. The statement is often made, "Our child is nervous, painfully embarrassed, but he exhibits no fear, he simply stutters." True! Yet the stuttering is but a manifestation, a surface evidence of an undercurrent of fear. Heretofore fear has been called a symptom of stuttering. But with greater cogency, in the light of recent developments, we may declare stuttering to be a symptom of fear. Fear is behind the stuttering. But what is behind the fear? To reveal *that,* is the aim of psycho-analysis; and the cure consists in helping the patient to make the discovery for himself. That the cause of the specific fear must be somewhere in his individual life-history is perfectly self-evident. That the release from fear can only be a strictly individual experience is as true as that stuttering is an individual affliction. This is the position maintained by psycho-analysis. It goes further than any other method. It investigates deeper. It touches bed-rock.

A Comparison of Methods

As the arrival of a new theory creates discussion, so the appearance of a new method stimulates comparison. Therefore, since it has been the writer's good fortune to have some acquaintance with three chief methods for the treatment of stuttering, it seems worth while to note how they stand toward each other and toward the Freudian which promises to supersede the others. Slightly in harmony with it is the Liebmann (method); distinctly antagonistic is the best known, the Gutzmann; and boldly combined with it is the last of the three, the Scripture.

Because this paper will be confined to stuttering, to avoid

misunderstanding it may be well to state here, in the beginning, the difference between stuttering and stammering—for they are not interchangeable terms, as many publications in English would lead us to infer. Concisely given the distinction is this:

The continuity of the stutterer's speech is interrupted by spasms of the muscles involved in speech-production; the continuity of the stammerer's speech is not broken, but his pronunciation is at fault. The stutterer *can* make every sound and combination of sounds, the stammerer cannot. In other words:

1) The stutterer has cramps of the speech muscles; the *stammerer* has *not.*

2) The stutterer cannot speak fluently; the *stammerer can.*

3) The stutterer can pronounce correctly; the *stammerer cannot.*

(To these should be added:)

4) The stutterer suffers from accessory muscle-movements ("Mitbewegungen"); the *stammerer never.*

Gutzmann describes the difference in one sentence by saying: "Stottern ist ein Fehler der Rede; Stammeln ein Fehler der Aussprache." (Sphhk., p. 490.)

Before leaving this comparison, one other matter must be mentioned, as it gives ground for wide divergence in treatment. The greater conscious effort a stutterer makes to talk in a normal manner, the worse his speech is obstructed; but the closer concentration a stammerer gives to overcome his difficulty, the better the result. Therefore the stutterer's attention must be diverted; the stammerer's attention, stimulated. The stutterer must learn to speak with less concentration, the stammerer with greater. (St. K., p. 73.)

Logically then, we might conclude at once—that stuttering and stammering are not open to the same process of correction—that a kind of treatment beneficial to the latter trouble may be harmful to the former. Liebmann is convinced that, on principle, the therapy of stammering must be different, in general, from that of stuttering. (St. K., p. 73.) In regard to harm it appears to be true that any exercise *whatsoever* which turns the stutterer's attention selfward in a morbid way is harmful; but if he can become so absorbed in what he is doing as to forget himself, then even an unnecessary exercise has relieved the patient for the *time being* and done that much good.

This brings us to a second point raised. Are certain exercises superfluous? Take another of the above given *comparisons* and see if it is not justifiable to question thus: The

stutterer being *able* to produce all possible sounds, why should he be bored with exercises in vocalization and articulation?

Here we strike another subject of contention. Liebmann confidently asserts that all such exercises can be entirely dispensed with—"that one arrives at the goal quicker without them." (St. K., p. 8.) Much that is done for the stutterer is sheer waste of time and strength. There is much misdirected effort. Also, a method requiring the patient to speak in an unnatural manner long enough to form an annoying habit, may fix a peculiarity as difficult to remove as the stuttering itself. To avoid these pitfalls, exercises thought necessary by Gutzmann and his followers, Liebmann declines to use, and then proves quite superfluous, as his success testifies.

Upon what further theory and practice this success depends, we can discover by a more extended search. For now, having disposed of preliminaries, we may divide our investigation into three parts, and take up here

Part I. The Liebmann Method[1]

In this method there are important things to be noticed, such as the following: The stutterer does not need a course in phonation. He can speak as well as anybody, *if* his extreme *self-consciousness* and his painful anxiety are removed. His unnatural breathing is caused by anxiety—hence, do not bother with breathing-exercises; but exorcise the fear. *So Liebmann believes that the physician's chief aim should be to free the patient from anxiety.* This purpose is in harmony with that of psycho-analysis; but there the similarity ends, save that both methods necessitate individual treatment. He says it must be "*primarily psychic,*" and though an observer soon becomes aware that its best results are from the effect of soul upon soul and perforce educational, yet they are not so in the deeply penetrating way distinctive of psycho-analysis. Liebmann's method is based largely upon the personal influence of the physician and upon the power of suggestion. A gentle, persuasive sympathy soothes the patient's excitability and overcomes reluctance and hesitation. Praise is one of the most potent agents in casting out fear; and a little flattery raises the patient's self-esteem while erasing the memory of the cruel sting of past ridicule. Timidity gives place to courage; because there will *be* no such thing as failure, it is excluded. If perchance he stutters, *it is overlooked.* The doctor's imperturbable calm remains unmoved. Perhaps he did not hear. Maybe it was *insignificant* anyway. With a

[1] See "*Stotternde Kinder*" von *Dr.* (Med.) *Albert Liebmann,* Berlin. Verlag von Reuther u. Reichard, 1903.

glad heart the patient begins to think so, and then progress is rapid. From the initial half-hour on the first day to the last treatment of the series stuttering is *prevented.* This is brought about 1)by assigning him only what he will be able to do, either with or without help; 2) by speaking and reading together; 3) by gradual withdrawal of assistance; 4) by interrupting him when he seems on the verge of stuttering; 5) by giving him "psychic preparation" when a strain upon his nerves is likely to occur—for instance, if he is to converse with strangers.

Of course a stutterer out of childhood will wish to know and will ask why he stutters. But even a child can understand the so-called resistance-theory—*"Der konsonantische Widerstand"*—also known as the theory of the exaggeration of the consonants. A child can distinguish between vowels and consonants. With the aid of a plaster-cast, a child can be made to realize that when consonants are sounded, then at the larynx, the palate (hard and soft) the teeth, the lips—as the case may be—the outgoing breath is kept from having free passage into the open air—in other words, meets with greater or less resistance. Next he is told that in stuttering the resistance is *too strong* and lasts *too long.* The consonants are held longer than is natural; *they are exaggerated;* and pauses take place, only ending when the vowel comes at last. (St. K., p. 11.)

The child can *feel* how much easier it is to sound the vowels —that no special resistance is offered then. Finally he sees that singing must be easier yet because the vowels are lengthened. Nearly all of the patients are very young children from five to seven or eight years of age. It would be senseless to talk to them about voluntary and involuntary incoördinate breathing and speech-movements, so the doctor fits the explanation to the patient.

This insight gained, he is ready to go through the various requirements in the approved succession from the least to the most difficult, as follows: 1) Singing. 2) Use of lengthened vowels in separate words and in short sentences spoken with instructor. 3) Short sentences repeated after the instructor who ceases gradually to lengthen the vowels. 4) Question containing part of answer. 5) Reading with no omissions and no changes of text. 6) Short story given sentence by sentence, patient repeating word for word. 7) Same story given connectedly. Patient repeats it. 8) Long story given connectedly but once; patient tells what he remembers. 9) Patient must read through a story of several pages and give it in his own words as a connected whole. 10) Ques-

tions in Mathematics, Physics, Geography, History, etc. 11) Topics of the day. Spontaneous speech. 12) Conversation in foreign languages.

During all this time the doctor's effort has been to establish complete coördination of the speech-movements. This harmony cannot be gained while the patient's thoughts are constantly occupied with his feelings. To turn his mind elsewhere has been one aim of the speech-training. Little children are given picture-cards with one object shown on a card; then follow picture-books with one picture and perhaps a short story on a page. The text must be simple and offer material for question and answer. After a while larger books with more interesting pictures and longer stories increase the difficulties but also the fascination, until finally very large pictures mounted on card-board and having movable parts—representing birds, bridges, tools, men, women, children, etc.—accomplish the desired end. The child-stutterer is far, far away from his troubles, and he talks freely and fluently without shyness, embarrassment, or fear. Thus the coördination is *conditioned* upon the removal of fear—the general fear of speaking (Sprechangst) and the special fear of certain sounds (Lautfurcht).

Of what is the patient afraid? Seemingly of the *act* of speaking; or he may be afraid of some sound difficult for him to make. Liebmann does not specify that the stutterer shrinks from some *other* difficulty buried in the depths of his being, or that he may really be afraid of himself; and that the fear is often transferred to these conscious acts—as Freud has taught us. Every thinking human-being will seek to give a reasonable explanation of his fear. The stutterer appears to be doing this; but his anxiety is entirely out of proportion to the *ostensible* cause, and the adequate one is far "out of sight, out of mind" in the depths of the subconscious. This illustrates the light that was darkness before the advent of psycho-analysis.

So it is seen that the "psychic treatment" and speech-training are inseparable. Liebmann concedes that many roads lead to the Rome of success; but he condemns utterly some of the "helps along the way"—Ex.—The use of a book of exercises. He says: "The children are obliged to read the same stories, learn and repeat the same poems, answer the same lists of questions over and over again. A parrot-like facility is attained; but this is poor preparation for daily life." It must be admitted that the little Übungsbuch arranged by Albert Gutzmann, and recommended by his son, Professor Hermann Gutzmann, falls in line with this criticism.

In the Berlin public schools any visitor may have the pleasure of seeing how well adapted such exercises are to class work; yet he can seldom manage to go home with a pupil to find out whether hesitating speech has ceased there.

On a number of important matters Liebmann is at variance with Gutzmann and has classed his method as among the less serviceable ("weniger brauchbar.") In this connection it will be of much advantage to consider the principles upon which the latter method is founded.

Part II. The Gutzmann Method

Perhaps we shall arrive sooner at the heart of the matter by making quotations now and then.

First Gutzmann wishes us to understand that in spite of every effort, one will never be able to cure stuttering by psychic means alone—because the Kussmaul definition still holds good that stuttering is a spastic coördination-neurosis resting upon an inborn (congenital, "angeboren") weakness of the articulation apparatus.[2] For this reason hypnotic treatment has been of no avail except when employed in connection with a drill-therapy ("mit einer physiologisch-gymnastischen Übungstherapie.") So likewise suggestion apart from hypnosis, is absolutely of no use, if the stutterer is not shown correct speech-coördination ("die richtige Koordination der Sprache.") The mere removal of wrong ideas and anxious imaginings will accomplish nothing. (Sphhk., p. 394.)

Nevertheless, as we have seen, Liebmann reports success through simple suggestion and without the aid of physiological-gymnastic exercises. In his opinion the sole value of the latter lies in their psychic effect. He writes, "If the doctor succeeds in impressing upon the patient the conviction that by means of these exercises in breathing, vocalization, and articulation, he will learn to speak better—then, gradually the desired result will be brought about." (St. K., p. 51.)

Fröschel is of like mind for he says, "It lies far from me to doubt the *serviceableness* of the Gutzmann method, especially since I myself have used it for years, only I explain its worth otherwise than does Gutzmann. Namely, aside from the training of muscles grown accustomed to wrong action in breathing, I attribute to it solely (lediglich) suggestive value, and it seems to me no less adapted to this purpose than the other methods which I also use as helps.[3]

[2] See "*Sprachheilkunde*" von *Prof. Dr. Hermann Gutzmann*. Berlin, Fischer's Medicin. Buchhandlung H. Kornfeld, 1912.

[3] See "Über die Behandlung des Stotterns" von *Emil Fröschel* (Wien Univ.), vol. III, 1913. "Zentralblatt für Psychoanalyse u. Psychotherapie, p. 497.

Gutzmann finds in his own drill-therapy an extraordinarily strong suggestive factor that of itself works psychotherapeutically. Further he adds: "*It is questionable* whether those speech-disturbances (Stuttering, Cluttering, Phonasthenia, etc.) where the morbid activity of the emotions makes itself very plainly apparent, require a special psycho-therapy besides." (Sphhk., p. 191.)

In another place we read: When the patient becomes aware of the fact—I must speak thus and so; that is the way all other people speak; if I speak as directed, I cannot stutter—then the problem (Rätsel) of psychic treatment is solved. There is need of no other ("Es bedarf eben keiner mehr.") (Sphhk., p. 437.) Also—"He who follows the physiological method aright needs no special psychic method of treatment—the psychic treatment lies within the *conscious physiological practice,* being its very essence." (Sphhk., p. 437.)

From similar sentences we feel certain that Gutzmann will not look upon psycho-analysis with favor. This expectation is realized when his criticism of Stekel is before us. To be sure more leniency is exhibited toward Frank and Laubi. (Sphhk., p. 397, 438, 444) yet the general remarks are somewhat acrimonious—possibly not without cause as may presently appear.

Gutzmann declares that "*in all cases*" the psychic depression is ("eine Folgeerscheinung") a manifestation resulting from and hence following the stuttering. Thus he believes the speech-disturbance to be the primary evil and the depression, the secondary one. (Sphhk., p. 391.) But psycho-analysis considers the emotional disturbance primary—the stuttering secondary. The obvious impossibility of maintaining at the same time, two opinions so conflicting that one is a complete reversal of the other, tells us why Gutzmann *must* be hostile to the Freudian method, if he wishes to hold his own. Are not signs of irritation, on his part, a good indication that the antagonist is formidable?

Both Liebmann and Gutzmann interest the stutterer in something. Now one might think it of small consequence whether pictures or gymnastic exercises, for example, held the child's attention, but such would be a mistaken idea. Liebmann's patient is really able to forget, for a while, his own existence, but Gutzmann's patient is reminded every moment of his body and of his affliction. The relation between self and the important task is ever kept in the foreground of consciousness. Everything is for self, through self, and to a large extent by self. A lazy or an indifferent stutterer will

never bring about the desired cure, because part of the treatment is *conscious* self help. He can hire no substitute; the ego must work out its own freedom. In this there is resemblance to psycho-analysis. The master-mind of the physician, furnishes the necessary knowledge, and directs the various efforts required of the patient who, however, is obliged to use his own brain powers.

Liebmann would have the stutterer's transformation wrought naturally, by a process as unobtrusive as growth. Gutzmann calls "*conscious* physiological practice" the chief thing, "*the soul*" of his method. (Sphhk., p. 436.)

Now when the emotions have been relegated to second place, then the treatment has to consider will-power before feelings. The supreme thing for the patient is to acquire good control of the body. In the particular matter of normal speech production, Gutzmann insists on correct breathing as the first essential If the stutterer is to perform a miracle, he must gain strength of the respiratory muscles, and skill in their use. To this end breathing is combined with gymnastic exercises. Conscious control of the breath is imperative; and the energy can be developed in the average patient. One fine exercise demands the conscious separation of associated muscular movements. Usually, however, the more or less difficult attempt is made to coördinate certain muscular actions which do not function together as they should. Even though, as a rule, one cannot locate anatomically a definite central lesion to account for the stuttering, yet we are assured that the seat of the trouble is central. Moreover, as Gutzmann says, cultivating vigor of will constitutes also an exercise of the center or centers which control coördination of the muscular activities. So in this way we make a direct attack upon "den Sitz des Stotterübels." (Sphhk., p. 154.)

The Gutzmann patient must know both what he is doing and the reason why. Hence with each exercise is given a question or a set of questions which he must answer as instructed. When he has memorized the printed explanations, then he cannot be ignorant of the subject-matter, and the right replies will be forthcoming. These exercises and accompanying questions are intended to form part of the daily program.

In vocalization we are shown at once that in passing from (1) Breath to (2) Whisper, and from (2) Whisper to (3) Voice—during a single expiration—we have "*the foundation exercise*" for every systematic voice-practice (training.) (Sphhk., p. 17, and p. 158.)

Moreover, it is important to observe the succession as in-

dicated—" for by keeping to this normal order those muscles move (one after the other) which must work together in *immediate* voice-production A complicated, coördinated action (Bewegung) of the involved muscles is thus split up, or separated, into its several components—first separated and then reunited to produce *voice*. When this is effected the so-called " Stimmkoordination " is again restored.

After the patient has learned to do this, then he is thoroughly drilled in the three different modes of attack—1)the hard (or direct), 2) the aspirated, 3) the soft (or indirect)—der feste Stimmeinsatz, der gehauchte, der leise. All the words must be practised in this manner. As to pitch and intensity, the *one* should be as low and the *other* as slight as possible, depending on the individual concerned.—When single words are taken, the patient is trained to give the initial vowels gently, softly, and considerably lengthened. The same is true of the first vowel of the first word after any pause for breath —thus, of course, at the beginning of every sentence.

To avoid unnatural pauses and to increase fluency, the words of a sentence are linked to each other and are spoken like one long word. In this way smooth, unbroken speech is secured in the progress of time. Frequently some preparatory work is of advantage before entering upon the difficulties of perfect articulation. This is indispensable if the patient is backward in speech development: Lip-gymnastics, tongue-gymnastics, jaw-movements serve to gain flexibility and thus to strengthen weak muscles. So when the stutterer comes to the consonant exercises, he can take correct positions and give the various sounds with less exertion. He receives the necessary directions, and soon he thinks himself able to tackle any sound-combination in the language. The consonants, in turn, all have attention; and they are used in syllables, in words, in sentences—as the case may be. The same consonant may occur many times in the same sentence; or a certain rule may be illustrated by a group of sentences.

From single sentences unconnected in thought, the stutterer passes to short stories, then to longer stories, poems, and dialogues. These are made more valuable through free conversation, narration, declamation, etc. Thirteen rules for speaking (Sprechregeln) are learned by heart, and if the patient can remember to carry them out, day after day, his self help has become practical.

Liebmann has referred to this method as among the " less serviceable " because he thinks that very young children cannot hold to " conscious practice " all the time—and that for older children and adults the course is a very roundabout

way of reaching their heart's desire. Also he sees that the patient runs a risk of being made ridiculous. The sharply distinguished vowel-positions, the speaking in a soft, low-pitched voice, the lengthening of the first vowel in the Sprechsatz (whatever can be spoken in one breath)—these all encourage speech habits too conspicuous to escape notice. The quick, deep breath *drawn through the mouth* just before speaking, seemed to be the most objectionable *requirement* made in the speech defect classes in the Berlin public schools when the present writer visited them not long ago.

Now from over-drill the numerous exercises can be given automatically, thus destroying their value. Gutzmann warns against mechanical work. Such a contingency need hardly be planned for under the Liebmann method where an infinite variety of material is offered and where repetition is discouraged.

Gutzmann says it is easy to prove stuttering a coördination-neurosis. This can be done by examining the stutterer, and testing separately the different components of speech when the element of anxiety is excluded—" mit Ausschluss der Angstaffekte." Evidently he does not mean excluded from the patient, but excluded from the patient's speech. We read:

Test I. " For example, when I test the patient's ability to make a long, even expiration—such as is necessary for fluent speech—then I do not allow him to speak at all. Hence in the stutterer, the anxiety-affect, *too*, cannot *emerge* for that reason—and as a matter of fact he imitates the slow expiration at once." The word *" emerge "* (auftauchen) is significant. Its use implies not that the anxiety has been actually banished, but that it is in repression. The little word *" too "* (auch) indicates the same thing. Therefore we are not surprised over what comes next: " But if we see how he makes that expiration, then we find in every stutterer *without exception,* gross faults in the mechanism—we find, for instance, that the expiration comes to an end within (schon nach) a very short space of time, that after from four to six seconds no more air stands at (the patient's) disposal; or else, that what may be there goes out irregularly, in jerks—*'saccadiert.'* The total volume of air is not, however, diminished thereby—for the vital capacity of stutterers is entirely normal. Ergo, it has to do with faulty functioning—with the wrong use of the necessary, sufficient volume of air." (Sphhk., p. 392-3.)

Since it is a well-known fact that fear and anxiety make the breathing shallow, quick and irregular, why may not this

" faulty functioning " be due to the anxiety-affect which has been prevented from having outlet in speech?

Test II. As speech cannot be divorced from breath, so a voice-test must be made subject to that condition. Gutzmann continues: " But there are stutterers enough who can sustain a given vowel quietly, without difficulty and without stumbling who also do not even stutter upon beginning the vowel." Here a voice-test will show departures from the normal. " One finds a slight tremolo, varying intensity, inability to keep the same pitch, etc." (Sphhk., p. 393.)

Test III. Gutzmann then adds: " Likewise one can very easily convince one's self that the stutterer is making wrong movements even when he appears to be speaking fluently." '(Sphhk., p 393.) His trouble shows itself in the characteristic faulty respiration. Gutzmann mentions having often observed cases of this kind; and he draws the conclusion that stuttering may not be identified with stumbling (Anstossen.) He says: " Stuttering is the general disease taken as a whole; Anstossen on the other hand, only the especially clearly visible and audible manifestations. Consequently there are stutterers who do not stumble in speech and nevertheless stutter. That sounds paradoxical, but it is a fact. I have had under treatment stutterers whom I have never heard stutter; and I would not have known where a drill-therapy should begin with them, if—with the help of the respiration-tests described—I had not laid bare the disturbances which had *not* become apparent upon superficial observation." (Sphhk., p. 408.)

This broad conception of stuttering is thus made to include cases which do not have the usual outward manifestations, cases which would be quite mystifying were it not for the revelations of the respiratory-curve. In other words, they appear to be cases marked only by a disturbance of breathing. But since fear (anxiety) may produce the same " faulty functioning," how is anyone to tell which is the foundation-cause, stuttering or " angst-affekt "? Has not the respiratory-curve much interest for the psycho-analyst in connection with hysterical conversion?

Some of the most fruitful results have been obtained in experimental-phonetics by the study of " respiratory-curves." A graphic representation of the stutterer's peculiarities of breathing may indicate the true difficulty in obscure cases.

The study of respiratory-curves is most satisfying, and Scripture has devoted much time to it. With this statement we have come to the place where an insight into his method will be the next step.

The Scripture Method

Scripture has utilized psycho-analytic principles to re-enforce a melody-cure of stuttering.[4] We are asked to think of stuttering as "a diseased state of mind," as a serious disturbance whose cause is "*purely mental,*" below the threshold of consciousness, and hence unknown to the sufferer. Since it is quite possible that conflicting desires may delay, or prevent, a cure, therefore his self-concealed motives must be lured from their place of retreat, and the physician must make the patient acquainted with himself. Consciously he may wish to be cured; subconsciously, *not.* The reason may be surprisingly simple. Thus Scripture suggests that an extremely timid person instinctively may seize upon stuttering in order to secure much loved solitude. *Certainly,*—a human being in an infantile stage of *development* may take such means to an end; and it should not be forgotten that stuttering begins in most cases so early in life—it may even appear when a child is but two years of age—that the mind has not yet been trained in discernment. Then by the time the stuttering is firmly fixed, the original motive for it has probably passed out of consciousness and cannot be produced upon inquiry. To establish in the patient a conscious connection with the infantile period of his existence is the most certain way to make his obstinate symptoms vanish when their true causes become known to him. This duty can only be performed through psycho-analysis.

Liebmann explains the stutterer's fear as chiefly the cumulative effect of many "psychic insults," while Scripture accounts for the anxiety as due "*partly to past failures, and partly to underlying causes*" well worth painstaking search. He mentions fear, anxiety, embarrassment, etc.—but he seems to prefer the milder term "timidity" to describe the stutterer's attitude toward his environment. Whether timidity comes from stuttering or stuttering from timidity is a question which Scripture answers in favor of the latter view. First he writes: "It may well be that timidity is the basis on which stuttering arises. If this be true, stuttering would then be a condition in which timidity shows itself by a peculiarity of speech." (S. & L., p. 39.) Further on he concludes,—"Stuttering is therefore a diseased state of mind which arises from *excessive* timidity," etc. (S. & L., p. 41.) But why do not all timid people stutter? Why do not neurasthenics and psychasthenics have speech-difficulty, when their mental condition is often found to be similar to that of the stutterer?

[4] See "*Stuttering and Lisping*" by *E. W. Scripture,* Ph. D. (Leipsic), M. D. (Munich). Macmillan Co., New York, 1912.

Scripture says,—"When the normal speech-mechanism is strong, the psychasthenic impulse must find some other outlet." (S. & L., p. 41.) Here we recall the recognized fact that little girls learn to talk at an earlier age than little boys and speak more fluently. The normal speech-mechanism of the normal little girl is remarkably strong. May not this indicate why girls are more likely to become hysteria-subjects than stutterers? In a comparatively recent article Fletcher[5] gives the following as one reason for rejecting psycho-analysis in the treatment of stuttering. He writes,—"The hysterical conditions supposed to be caused by the suppression of the sexual complexes seem to be more characteristic of females than of males, while stuttering is many times more common in males than in females." (p. 244.) But Stekel speaks of stuttering as "eine Form der Angsthysterie."

Could not stuttering be considered the equivalent (the substitute) among males for hysteria among females?

Now even though Scripture has referred to timidity as "the basis upon which stuttering arises," yet he places anxiety (fear, embarrassment) second in the list of symptoms. There we find named first—"psychic *hypertonicity* and spasms of the muscles of speech." Moreover this overtension appears only when the stutterer intends to speak. Also, if he is unheard—or thinks himself so—he has little or no difficulty in giving oral expression to what is passing through his mind. Scripture's observation confirms that of Liebmann, but is contrary to Gutzmann's. Scripture reports,—"When a stutterer who has become so accustomed to me that he speaks perfectly in my presence, is placed at the telephone, he will continue to speak perfectly as long as he sees my finger on the switch that cuts it off; the moment it is removed he knows that 'central' will hear him and he begins to stutter." (S. & L., p. 36.) He must be virtually *alone*. Scripture calls attention to the existence of these stutter-symptoms *only* in the presence of other people. So the stutterer's *retiring disposition* is explained as either a natural inclination, or as a measure of self-protection.

More or less severe cramps or spasms of the speech-muscles are the most distressing symptoms of stuttering; and to remove this over-tension is the object of the "melody-cure." In this method as in others, the normal speaking-voice is approached by way of the *singing-voice*. The patient's high-strung, emotional condition must be relieved by practice in general relaxation, and there must be exercises to correct

[5] See *"An Experimental Study of Stuttering,"* by *John Madison Fletcher, Amer. Jour. of Psychology,* April, 1914, pp. 201-255.

abnormal functioning. We find abdominal-cramps, diaphragm-cramps, laryngeal-cramps; indeed, cramps of all the muscles connected with speech. To overcome the first two hindrances to fluency, the patient is required to devote some time to calisthenics; to practice control of the breath in singing, reading, and speaking; and to make frequent use of the "*octave-twist*" which will be described presently. Scripture says,—"The abnormality in breathing usually disappears when the stutterer speaks with the octave-twist. (S. & L., p. 85.)

The stutter-voice, being caused by laryngeal cramps, is characterized by the monotonous laryngeal tone which we are assured is *present in every case of stuttering*. "For when the muscles cannot have free action, the vocal-cords in vibrating must produce hard, unmusical tones." To correct this there are many fine melody-exercises where words and sentences are sung or spoken with every possible variation of pitch. The "octave-twist" is recommended, in particular, for flexibility.

In the octave-twist the laryngeal tone passes over an octave while the first important vowel of a word is being given. In doing this the voice changes from the *chest*-register to the *head*-register; this exercise forces the patient to make a new adjustment of the vocal-cords, thus relaxing the muscles. Scripture cautions that it will not be easy and the patient will probably fall short, going only from C to G—but unless he reaches the full octave there will be no benefit. (See p. 79, S. & L.) This is doubtless an excellent exercise; the patient cannot help feeling very self-conscious, however, and imagining himself an object of ridicule.

There are numerous exercises for general indistinctness and for expression. The use of the *breath-indicator* is a help toward securing perfect enunciation. The lips, the tongue, the jaw, all must be relieved of muscular tension, so directions are given for that. In reading there is the familiar linking of words and lengthening of the first vowel, or else giving it with the octave-twist.

After the patient is able to repeat anything said by the instructor, and to read well with him, *then* spontaneous speech and self-confidence are to be developed. Scenes-from-life form part of the play that is nevertheless work for the stutterer. He takes the different rôles in turn. There is no lack of variety, though he may have a hard time. Question and answer, descriptions and narrations, also reading alone—these things foster independence and a degree of self-assertion hitherto foreign to his shrinking self. Scripture thinks that

the boldness or indifference exhibited by some stutterers is only a kind of bravado to cover up timidity.

Soon the patient is obliged to show what he can do before other people. He plays store, sells tickets, introduces people to each other, plays games, recites poems, delivers speeches, etc. A strong, commanding voice is cultivated by shouting, by speaking through a megaphone, or by the use of a private telephone.

Not a few stutterers are lively beyond bounds. Such children need to be suppressed, to be shown how to control themselves. They speak with too great haste. They must be required to speak slowly—in time to the metronome, or to the beating of sticks. Reading with prolonged vowels is good practice for these excited, over-impulsive patients. Above all things they must learn to keep *silence*—not to interrupt other people when they are talking, and not to take more than a fair share of the conversation.

In contrast to these emotional *jumping Jacks* come the representatives of the other extreme of feeling. These patients are shy, timid, ashamed or afraid to speak—and many of them are tearful and depressed. In cases of this kind the first essential to cure is a hopeful and cheerful frame of mind. Encouragement must be given even up to the breaking-point of truth—but not beyond, never beyond, lest confidence break also.

Throughout the treatment one thing should go along parallel with all the other efforts. The stutterer's habits of thought must be changed. It is quite apparent that his mental action is abnormal most of the time. The least excitement throws him into a state of confusion. When asked a question, he simply cannot think. He cannot concentrate his mind upon anything. He does not know what he wants to say. His hesitating thought makes hesitating speech. By degrees, however, it is possible, at the cost of infinite patience, to alter this. A stutterer can be trained to observe carefully, describe accurately, think quickly, decide promptly, keep to the subject chosen, and to be sure of what he knows. It is not necessary to enter into details as to how this is accomplished; but one exercise in association-of-ideas is of interest as leading up to the "Jung Association Test." The exercise is given "to quicken mental processes" and help the stutterer to go directly to the point every time. The first call is for simple association. Ex.—Flower, rose. The next step is association in a series. Ex.—Garden, flowers, seeds, roots, earth, etc. The third request is for association of part to whole. Ex.—Lumber, house,—or from whole to part—Ex.—Room, floor.

From words suggesting other words—under partial control, as one might say, it is a near matter to let the patient take "a starter" and move along as inclined. These running associations are eagerly followed in the hope of obtaining clews to the life-mysteries which influence conduct. The final but ever-present purpose is to modify or to remove peculiarities of character very obvious to the family and friends of the stutterer. This real education deals with his repressed natural instincts, with his emotional history from *babyhood,* with his conscious and his unconscious aims, with his attitude toward other people and toward himself, with his fancies, and with his dreams. In their interpretation the subconscious region of the mind is explored; and a new map of the divided country is laid out for the edification of the ego. As psycho-analytic patients will testify—after such a view of the land, we not only "see ourselves as others see us," but we see everything within ourselves; and that what we accuse others of being, *that* is largely what we are.

Revelations so wonderful as to be almost incredible must "make a new man" of the patient, if there is anything left when these labors are ended. At any rate whether there be much or little, he may make a new beginning with what he has. He may pluck up courage and go forward relieved of his burden. He always could sing; and now it will be the praises of psycho-analysis.

THE OPTIMUM TEMPERATURE FOR MENTAL WORK

By William H. Burnham

A suitable temperature is absolutely essential for the life of the human organism. If our bodies are subjected to too low a temperature for a long period without protection, the nervous system shows symptoms of paralysis, and finally death ensues. If the body is exposed to a high temperature for a long time, especially with great humidity, which hinders the evaporation from the skin and the cooling off by this means, then the body temperature rises and serious nervous symptoms may appear, at first a feeling of discomfort and sleepiness, and finally heatstroke.

The body is usually kept in a temperature of about 90° F. by the clothing that we wear. That is, the temperature of the surrounding air under our clothing is about 90°. This is a tropical temperature, and we regulate this as we go toward the tropics by wearing less clothing; as we go toward the arctic regions, by wearing more clothing. With the usual metabolism and this covering of clothing more heat is produced than the body needs. Thus it is a matter of vital concern to the welfare of the organism to eliminate the superfluous heat. An elaborate and wonderful mechanism exists for this purpose. Nature's method is in part as follows: First of all in an overheated atmosphere the tendency is for one to stretch out the limbs and take a bodily posture that will expose the maximum surface to the air. A special nerve center rushes the blood to the surface of the body so that it can be cooled off by contact with the external air, the blood being at a temperature usually less than that of the surrounding atmosphere. Again, if the heat is extreme, perspiration occurs, and still further heat is thrown off by the elimination of moisture from the lungs. The success or failure of the body in accomplishing this purpose depends quite as much on the humidity of the external air as on its temperature. The relation of humidity to bodily comfort, however, although an essential part of the problem of temperature is another story which cannot be told in the present paper.

The well-accepted view is that the body temperature remains constant at 98 6-10° F. or 37° Cent. This, however,

is only an extremely rough statement of what is true of the interior of the body, perhaps on an average at certain times in the day; but the variations at different times of the day, and with different individuals, and with the same individual on different days, are great. These conditions should be considered somewhat especially.

1. The body temperature fluctuates through a considerable range during the day, the minimum temperature being at night and in the early morning hours, and the maximum temperature early in the afternoon. This is well illustrated by experiments made by Benedict and Carpenter (3). They and other observers found a range of variation during the 24 hours of several degrees Fahrenheit. They found the minimum from 3 to 5 in the morning, a marked rise at about 7 o'clock, a slow steady rise during the daytime, reaching the highest point in the afternoon between 3 and 6, then an evening fall with marked falling temperature after going to bed, the minimum being reached again between 3 and 5 in the morning. Thus it becomes important to know the normal physiological facts for each individual. This is apparently independent in large degree of the activity of the subjects. Polimanti (28) studied the body temperature of individuals who worked at night and slept in the daytime, and he found that in spite of their night work there was a similar fall in the body temperature during the night. Apparently, if we may trust these investigations, this change of body temperature represents an old biological rhythm which is determined by something deeper than the alternating activity of sleeping and waking hours.

2. Again there is a considerable range of variation of the body temperature from one day to another. With one of Benedict's subjects the range varied from 1.27° C., 2.29 F. on the first day to .93° C., 1.67 F., on the second day. Similar variations in the fluctuations from day to day were observed with other subjects.

3. Two individuals may differ considerably in regard to their average body temperature. The standard taken as the average, namely, 98.6, Benedict and Carpenter estimate as too high. The body temperature throughout the day seldom averages as high as this. Most physicians take the sublingual temperature, and that is usually too high.

4. The body temperature varies to an appreciable extent with variations in the surrounding temperature. The New York Commission (22) found that the temperature of the subjects studied at 8 in the morning, living in their own homes, was conditioned by the average atmospheric tempera-

ture of the preceding night. If the night had been warm, the body temperature in the morning was high; if cool, the body temperature was low. The variation amounted to about 1° F. for 20° of atmospheric temperature, although probably the variation was modified by clothing.

"The commission further found (22, p. 185) that, whatever the bodily temperature of its subjects might be at the beginning of an experiment, it was lowered by confinement in an atmosphere of 20° C. (68° F.) and 50 per cent. relative humidity, and raised by confinement at 23.9° C. (75° F.) with the same humidity, or still more by 30° C. (86° F.) with 80 per cent. humidity. The final average bodily temperatures in certain series of observations, where the subjects were confined in the observation chamber for from 4 to 7 hours, were as follows:

"After 20° C. (68° F.), 50 per cent. humidity, the average bodily temperature was 36.7° C. (98° F.).

"After 23.9° C. (75° F.), 50 per cent. humidity, the average bodily temperature was 36.9° C. (98.5° F.).

"After 30° C. (86° F.), 80 per cent. humidity, the average bodily temperature was 37.4° C. (99.3° F.)."

With an increase in the external temperature there is likely to be a rise in the body temperature, and this is accompanied by an increase in metabolism. Up to a certain optimum this increases the activity and efficiency of the organism. Beyond that, the increase in metabolism caused by increase in temperature brings about a condition where the oxidation and elimination processes are not sufficient to carry off the waste products with the necessary rapidity, toxic products accumulate, and thus fatigue comes quickly.

Recent studies indicate that the cause of heat stroke and sunstroke is an abnormal change in metabolism. There is apparently not merely a more rapid breaking down of tissue, but the effect of the toxic products produced is greater. Many experimental investigations indicate this. Patrizi (21) found that human muscles subjected to hot baths are quickly fatigued. Gad and Heymans (21) found that the excised muscles of frogs are rapidly fatigued when kept warm. In fevers resulting from bacterial infection one of the metabolic changes is an increased excretion of nitrogen, due, it is thought, to an increased destruction of the proteins of the tissues, probably caused largely by the direct action of the higher temperature upon them. A similar destruction of proteins is thought to occur as a result of hot baths, and the like. It seems probable also that in the overheating that results from exposure to a hot and humid atmosphere there

are likewise disturbances of metabolism. Different investigators have found that when the temperature of the body has been raised either experimentally, or otherwise, the alkalinity and coagulability of the blood may be diminished.

Again it seems to be a recognized law that poisons are more intense in their action the higher the temperature. Dr. Lee (21) has applied this law to the action of fatigue toxins in the body.

"There seems to be no reason," he says (21, p. 509), "why this law should not apply to the case under consideration. This suggestion has indeed been made for normal fatigue substances by Patrizi to explain the ready fatigueability of human muscles submitted to localized hot baths. With even greater weight it can be applied to the human being laboring under the disadvantageous conditions of excessive temperature and excessive humidity. Normal and pathological fatigue substances are here present in solution in an overheated body. If they are toxic at normal degrees of temperature, their toxicity is more pronounced at higher degrees, and in proportion as mechanical work is performed and internal temperature rises, the more is working power lessened."

The external temperature has a definite effect also on the rate of the heart beat. "The New York Commission found the average rate of its subjects confined in an atmosphere of 30° C. (86° F.) and 80 per cent. relative humidity to be 74, and in an atmosphere of 20° C. (68° F.) and 50 per cent. humidity to be 66. Eastman and I have seen the pulse rate increase by 39—from 67 to 106—as the temperature of the air surrounding the subject rose from 23.3° to 43.3° C. (74° to 110° F.) and the humidity from 50 to 90 per cent." (22, p. 185).

One fact is clearly established. For comfort, for efficient activity either physical or mental, for the preservation of life itself, it is necessary to eliminate the superfluous heat from the body. Whenever this is interfered with by improper clothing or by confining an individual in a small space without ventilation, accumulation of heat in the body, or *Wärmestauung,* as the Germans call it, occurs. This fact gives us the prime reason for ventilation. It is necessary first of all to ventilate rooms, not because of the excess of CO_2 that is found where individuals are confined in an enclosed space, not on account of the lack of oxygen, not primarily because of any organic posion, the socalled anthropotoxin of Du Bois-Reymond, but first of all to enable the occupants of a room to eliminate the superfluous heat from their bodies. This has been made emphatic by recent investigations.

Especially noteworthy are the experiments of Paul (25 and 27) in Flügge's laboratory in Breslau. Paul shut himself up in a glass cabinet just large enough for his body and a few simple instruments, and he breathed the same air over and over until it contained more CO 2 than would be found in the worst schoolrooms or theatres; but he could remain in this glass case without discomfort for over four hours, provided the temperature was not above 60° and the humidity not more than 72% of saturation. On the other hand when the temperature was raised to between 68° and 86° and the humidity was between 72% and 92% serious symptoms appeared in 15 minutes. He measured the surface temperature of his body and found that with this increase in the temperature of the air the temperature of his body had increased; and when it was raised 3 degrees, he felt a pressure like a band across his forehead, he suffered headache, vertigo, and nausea, and was on the verge of fainting.

That these symptoms were not due to lack of oxygen, or to "breath poison", or the like, was shown also by the fact that when the temperature had increased to 70° he put his head out of the cabinet, but it did him no good; and a man outside put his head into the cabinet, but it did him no harm. The danger comes largely from the storing of heat in the body. On the same principle it is said that if you sew a cat's head into a football, she will be none the worse for it; put her body into the football and leave her head outside and she will have a fit. (25)

The cases of fainting in public assemblies are instructive. Why, asks Dr. Northrup, (25) does a woman faint in the second or third act of a play and not in the first or fourth? His answer is that "when she goes into the theater the air is not surcharged with moisture. She is not overheated. She does not faint in the last act because people have complained and have secured a change of air. In the second or third act there is bad air." If in addition to the heated air of a crowded room one has the additional heat that comes from extra clothing, the condition is of course still worse. The following case reported recently in a Boston daily paper is a typical one. It was the case of a young man twenty years old attending a political rally. The report in the daily paper was as follows: "Quinlan, clad in a heavy overcoat, attended a rally at the Vine Street Church in the interest of John F. Fitzgerald. The crowd was wedged together closely, and the young man became faint. He was removed to the open. A doctor was summoned and pronounced Quinlan overcome by the heat."

If too high a temperature is combined with stagnant, impure air, the brain simply refuses to function.

A number of writers since Paul's investigations, Benedict, Hough, and Gulick and others in this country, and Reichenbach in Germany, have laid the chief emphasis on the temperature in relation to ventilation. According to their view the chief aim of ventilation is to keep the temperature within normal limits. At all events this is the primary aim. It is desirable, of course, to remove bad odors and excess of moisture, and the like; but if we keep the temperature and humidity within the proper limits there is apt to be little trouble with anything else.

In the words of the Ventilation Commission "the thermometer is the first essential in estimating the success of ventilation." (34, p. 631.)

As pointed out by Professor Hough (16) lack of suitable conditions for regulating the temperature of the body affects unfavorably the occupants of closed rooms, and any efforts at ventilation which neglect this primary problem are sure to fail, and those that provide for it are sure to be measurably successful.

There appears to be an optimum temperature for the activities of all organisms, for the human organism as well as for that of plants and animals. Dr. Huntington (17) has presented curves showing this optimum for the activities of lower organisms as well as of man, and it is noteworthy that the higher the organism the lower the optimum temperature.

Huntington's curves show approximate temperature optima for mental energy in human beings at about 40° F.; for mental and physical energy combined at 50° F.; for physical energy at 60° F.; for the absorption of oxygen by crayfish at 74 or 75° F.; for the rate of fission of infusoria at 83° F.; for the growth of plants at 85° or 86° F.

The question whether the temperature of the body itself has any appreciable influence on the ability to do mental work and whether or not the temperature is correlated with the degree of intelligence has been a problem; but recent studies in Karl Pearson's laboratory indicate that there is no correlation between the physiological temperature, the respiration, pulse, and other physiological variates, and the mental character. Two studies have been made, one of the oral temperatures in school children, and one of criminals. Miss Whiting, who made the latter study, found that the general physical condition has little relation to the physiological variates. She sums up her conclusions in part as follows:

"In a person, not ill enough for hospital treatment, tem-

perature, pulse, and respiration would hardly be a differential measure of general health, much less of the goodness or badness of the physique in general. It is true that the person in good health has a rather higher temperature and rather lower pulse-rate than one in poor or indifferent health. But there is no significant difference in respiration and the correlations are so low that not only no rough measures of temperature and pulse would aid diagnosis, but really fine numerical determinations would not be of any discriminating value. In capacity for hard labour the pulse plays no part, but it is associated with a slightly higher temperature and a slightly slower respiration. Muscularity is associated with higher temperature, slower pulse and slower respiration. Fatness with higher respiration and pulse, but has no apparent relation to temperature. Height and weight also have no sensible relation to temperature, the larger men have a slower respiration, but the effect of tallness is to slacken pulse, of greater weight to quicken it. Pulse and respiration quicken with age, but temperature falls. In every case, however, these associations are so small that they would be incapable of appreciation except as the mean results of large numbers of accurate records. For ordinary every day experience we can only conclude that nothing can be judged from the physiological variates of physique or from physique of the physiological variates." (32, p. 16.)

Miss Whiting sums up also as follows the investigation of school children by Williams, Bell and Pearson. (33) " It was shown that in a series of seven schools temperature was negatively correlated with weight for constant age, and further in six out of the seven school series negatively correlated with stature for constant age. The correlations were on the whole small, but definitely significant. In the great public schools the temperature appeared, allowing for age, to be lower than in the elementary schools. An association was thus suggested between intelligence and temperature, the more intelligent having the lower temperature. This result might well be considered as spurious, and due to differences of nature, particularly to differences of nutrition. On the other hand various writers have asserted that low temperatures are associated with low intelligence, and it is usually stated that the temperature of idiots is lower than that of normals."

Apparently, however, there is an optimum temperature for brain activity as well as for other physical activities. The writers in Richet's dictionary (2) think it certain that the activity of the brain and the medulla is affected when the temperature of the body rises or sinks. According to what

has been observed in men and animals affected with severe heat or cold, the suppression of function of the different parts of the central nervous system follows in general the following order: first, the intellectual faculties; second, voluntary movements; third, sensibility; fourth, motility; fifth, the innervation of the vegetative life. Important variations in the irritability of the nerve cells follow the same sequence.

As pointed out by Fröhlich (8) a series of factors are responsible for the injury to the nervous system by overheating the body; among these is a decrease of the amount of water in the blood, and an increase of the mineral salts. This condition increases the irritability of the nervous system, and with this the intensity of the metabolic processes. If we add to this, mental or physical work, then the oxygen supply is not adequate. The nervous system is so strongly affected that it loses its functional ability very rapidly. And Lee (22) points out that "the rise of external temperature by dilating the cutaneous blood vessels makes the brain anaemic, but it is not certain that variations in such temperature with or without variation in humidity markedly affect the action of the nerve tissues unless the variations are excessive."

There are of course great individual differences as regards the effects of temperature; here as everywhere a psychic factor must be reckoned with; and many conditions coöperate in determining what is called the "sensible temperature." This has been studied and discussed by a number of writers. According to Cleveland Abbe, (1) "the sensation of temperture depend on the temperature of the air, its dryness, the velocity of the wind, and the suddenness of atmospheric changes, all combined with the physiological condition of the observer. A complete expression of sensible temperature has not yet been obtained."

This socalled sensible temperature probably depends largely on the peripheral stimulation. And, as Dr. Gulick (10) has pointed out, there may be an advantage in changes of temperature within certain limits. To quote his words:

"It is an important fact, then, that man has never existed in an environment having a stable temperature. The changes of day and night, of sun and cloud, of wind and rain, of summer and winter have been productive of constant change in the temperature. Although man has engaged himself in guarding himself against such changes as are too great for comfort or health, by seeking or avoiding sunlight, utilizing the coolness of water, the protection of clothing, creating defenses against hot or cold winds, still, till the invention of the thermostat, such efforts mitigated the extremes of temperature rather than did away with change itself. Change in

temperature within certain general limitations seems to be one of the fundamental general facts about man's environment."

These limits, however, are pretty narrow, and outside of these limits it is not only true that danger to health soon comes; but there is probably an optimum for efficient brain activity. Recalling that excess of heat affects the brain centers first, it would seem probable that while extreme heat destroys one's ability to think, any increase in temperature above the optimum for the given individual would tend to decrease the amount of work done. We know relatively little about this, and individual variations are probably great, some persons being able to work at their best at a higher temperature than others. Unfortunately we have no studies which show the optimum doses of temperature for different kinds of work in case of different individuals. While the experimental evidence is somewhat conflicting, apparently there is such an optimum for each individual, and perhaps for diflerent kinds of mental work.

Schuyten, (29) who studied (by a crude method to be sure, i. e., the apparent ability to keep attention fixed on a school task in reading) the attention of school children in the schools of Antwerp for a whole academic year, found that the number of inattentive children stood in direct relation to the mean temperature, of Central Europe, the greatest number being in the hot summer months.

Huntington (17) also in his study of the work done by factory operatives in Connecticut found an annual course of production, low at the beginning of the year and falling still lower until the end of January, with a gradual increase throughout the spring until June, and a moderate decrease until the end of July. An increase in the autumn to a maximum in November, and then a winter decrease to the minimum in January. That is, production was greatest in the spring and autumn and at a minimum in winter and summer. A similar result was found among the workers in making electrical apparatus in Pittsburgh, and also by industrial workers in the southern states.

These results which seem to indicate an optimum temperature for industrial workers, not in the summer or in the winter, was corroborated by a study of the marks of students at West Point and Annapolis in certain classes, especially in mathematics. Huntington concludes that the optimum temperature of the outside air for physical work is about 60° F.; for mental work, about 40° F.

Some studies having a bearing on the effect of the temperature in general upon school work have been made.

Dexter (7) found that a high temperature diminished the

number of bad marks given both in schools in New York City and Denver, but he did not make any special study of the amount of work done. "High temperatures, as recorded at the Weather Bureau, did not increase, but rather diminished the number of bad marks given, both in the schools of New York City and Denver. The largest excesses of demerits (twenty per cent) were for temperatures between 45 and 60 degrees (mean), falling to fifty per cent less than normal for those between 80 and 90 degrees." (7, p. 547.)

His studies indicate the advantage of a low temperature for the discipline of the school, although excessive temperature also had a quieting effect. He describes a control investigation as follows:

"As a supplementary study. the deportment was referred to the temperature of the school room itself, which is observed and recorded by the teacher in each of the New York City Schools at three stated intervals during each day's session. The recorded temperatures of the different rooms varied from 60 to 80 degrees Fahr. Within these limits, those below 68 degrees were accompanied by less misdemeanors than the normal, hence may be interpreted as quieting in effect; those from 69 to 73 degrees showed about the normal, while, the highest temperatures recorded were accompanied by deficiency of disorder, twenty per cent less than the normal being recorded for a school room temperature of 79 degrees. This decrease of active disorder for conditions of most excessive heat was shown to a marked degree in a study of assault, suicide, and discipline in the penitentiary made in a manner similar to this, and without question is but a result of the physical lassitude which every one feels under such temperature, and is chronic with the inhabitants of the Torrid Zone."

A few investigations have been made to determine the effect of different degrees of temperature in the school-room on the working ability of the children. Observations were made a few years ago in three schoolrooms where sixth grade pupils studied in Crawfordsville, Indiana. Supt. Hines (13) reports the following notes in regard to the effects of different temperatures.

Temperature of 80 degrees, the class was restless, dull and incapable of continued mental effort; 76 degrees, the class was dull and sleepy, penmanship was poor; 75 degrees, class was dull and complained of the heat; 74 degrees, not quite so dull as above; 72 degrees, restless; 70 degrees, excellent work, cheerfulness in class; 68 degrees, best work, to-day seemed their best; 66 degrees, splendid work; 65 degrees, class happy and full of work, some complained about the

room's being cold; 60 degrees, too cold for good work, complained of the cold.

Tests were also made which although crude indicate the general advantage of a lower temperature than what is usual in the schools. The first is reported as follows (13, p. 110):

On the first day of the test, one room was held for an hour at a temperature of 80 degrees, the second at 75 degrees, and the third at 70 degrees. At the end of the hour a list of words for written spelling was given to each set of pupils, the same list in all three rooms. The average of the class on this list in the room at 80 degrees was 58.8; 75 degrees, 77; 70 degrees, 78.2. The cooler the room, the better the average. The difference here between 70 and 80 degrees in temperature caused a difference in scholarship average of 20 per cent.

Similar tests on succeeding days with the same temperature in each of the different rooms gave about the same averages, so that the varying results in the first day's test seem to be fairly attributed to the differences in temperature.

Another interesting test is reported as follows (13, p. 112): Another test of the effect of temperature was made in three third grade rooms. One of these rooms, because of a defective heating apparatus which failed to do the work required and was therefore being rebuilt, had for the period of about eight weeks a temperature averaging 66 degrees. One of the other two rooms had an average temperature of 70 degrees, and the third one about 71 degrees. Toward the close of this period, tests in arithmetic and English were given. The pupils in the coolest room received the best grades in both cases. There had been times when the one room was too cold for good work, but there never had been a time when the brains of the children were dulled because of the excessive heat. The children of the other rooms were listless at times because of the heat. During a good part of this time the pupils in the cool room attended only a half day while the others attended all day. In spite of (or on account of) the half day attendance, the pupils in the cool room excelled those in the hot rooms who attended all day.

Lehmann and Pedersen (23) have come to closer quarters with the problem by experimental methods. They made tests of their subjects' ability to add each morning either directly before or after dynamometric tests, adding seven columns of fifty one-place numbers. The dependence of the rapidity of adding on the strength of the light or of the air pressure was not shown; but of all the external factors temperature was the one that did have a demonstrable influence. All such factors, as the food taken, the work done the preceding day,

the sleep, and so on, did have a greater influence on adding than on the muscular strength, but none of these seemed to have any such influence as the temperature. There appeared to be distinctly an optimum temperature for the best performance in adding; with a lower temperature or higher temperature less work could be done in a given time, or more strictly, the amount added in a given time was decreased.

Their studies indicate that the different mental functions are differently affected by the different factors in the weather. Memory performance seems to be dependent upon light, temperature, and atmospheric pressure; but as regards the process of adding they found only a dependence on the temperature. The results show that the rapidity in adding is influenced neither by the intensity of light nor by the smaller or larger or shorter or longer continuing variations in air pressure. On the other hand, it is dependent on the temperature, in such a way that it increases if the temperature approaches a certain optimum varying for the individual and it sinks when the temperature varies from the optimum.

Their investigations of the muscular strength in relation to the temperature are also significant. They found that there was an optimum temperature for the muscular strength, this optimum varying with the individual. This optimum temperature for the muscular strength is higher than for the mental work of adding. Both higher as well as lower temperatures decrease one's strength. There is a yearly periodic variation. In January in spite of the low temperature the muscular strength begins to increase with the intensity of the light, and this increase continues until the high temperature of the summer months in June to August brings about a standstill. With the sinking of the temperature in September the muscular strength begins to increase again; and at the beginning of November, finally, on account of the decrease of the intensity of the light and the decrease of the temperature, the increase is checked or a decrease occurs.

It is especially interesting that the optimum temperature for adding is much lower than it is for muscular strength. Why a lower temperature should be more favorable for adding than for muscular strength is not known, but the fact seems to be established by Lehmann and Pedersen's experiments.

The most serious attempt at investigating the effect of temperature conditions on intellectual workers in this country has been made by the New York State Commission on ventilation in their laboratories at the College of the City of New York during the past few years (*22*, 26, 30, 34). The

observations were based on nearly one hundred individuals for continuous periods of one to six weeks, from four to eight hours daily. From the report of their results made about a year and a half ago the effects of changes of temperature seem to be as follows:

Temperature they found exerts a marked influence on comfort. Temperature affects markedly certain physiological reactions, but within the range of from 68-86° F., the Commission did not find that it effects the ability to do mental work. It did, however, influence the attractiveness of the mental tasks.

The usual psychological tests were conducted by Thorndike (30); and in neither the young men or the young women who served as subjects could there be found any relation between the atmospheric conditions and the amount of mental work done. Further experiments have been made, but no complete report is at hand.

The results of Lehmann and Pedersen obtained in the laboratory, those found by Huntington in factories, and by the New York Commission, as well as the results of other investigations seem to indicate pretty clearly that the temperature is the most important of the different climatic factors in its influence upon human activity.

If we attempt to analyze the effects of temperature on brain work, apparently temporary conditions of overheating do not greatly incapacitate the person for the normal amount of work, but cause such discomfort and distraction of attention that the amount of work is decreased. For practical purposes this effect is as significant as if it were caused by the direct effect of the higher temperature on the brain.

The contradiction between the results found by Lehmann and Pedersen and those found by the New York Commission are apparently easily explained. The New York Commission found that when the subjects were allowed to work as they pleased their work fell off in the higher temperature, and they showed a distinct disinclination to work. Their subjects were, as I understand, paid for their services and pledged to work as rapidly as possible. Consequently they usually worked hard in spite of the uncomfortable temperature, while the subjects of Lehmann and Pedersen and the children in the schools studied by Huntington were under no such stimulus to work as hard as possible, and consequently gave up to their feelings, as we may assume, and hence accomplished less. The latter condition is that likely to be found among ordinary workers, and especially among school children.

It should be noted that investigations indicate that the younger the child the more susceptible the organism to changes in the temperature of the surrounding air. The child responds more quickly to increase in temperature or decrease in temperature; and while within certain limits the child's body can equalize changes in temperature more readily than that of the adult, outside these limits the child is more affected than the adult. The reasons for this greater susceptibility of the child to changes in temperature are in part obvious. They depend on the smallness of the child's body.

On account of the smallness of the child's body the reflex arcs are shorter and the vital processes go on more rapidly. The heart beat and respiration, for example, are much more rapid in the child than in the adult; hence heat is more rapidly produced in the child's organism. The effect of this is seen in the high degree of fever likely to be caused by even a slight disturbance in case of the child. On the other hand, on account of the smallness of the child's body and the relatively greater surface of the child's body as compared with its weight, heat is given off from the body much more rapidly in the child. These two factors, the shorter reflex arcs, conditioning relatively greater production of heat in the child and the relatively large surface of the child's body making the elimination of heat more rapid, in large part account for the greater succeptibility of the child to changes of temperature. Children frequently suffer greatly from too large an amount of clothing, especially children on the cars and the like, where the heat is extreme, and parents do not take the trouble to remove the outside wraps that the children wear.

The practical problem of the best temperature for a schoolroom should receive attention. Custom varies. In English schools probably the temperature is usually kept between 60 and 65° Farenheit; in this country it varies usually between 65° and 80°. From observation it is probably safe to say that most American schoolrooms are over-heated. Recent observations and tests in the schoolroom emphasize this. Hines (14) had reports from schools in different parts of this country, and he found:

"The temperatures recorded ranged from 60 to 76 degrees Fahrenheit. The temperatures were taken down as shown by the thermometers in use in the schoolrooms. In all too many cases the schoolroom thermometer was cheap and inaccurate. One room was at 60 degrees, two at 64, ten at 66, thirteen at 67, three at 73, one at 75, and ten at 76 degrees. The great majority of rooms in which temperatures were taken, one hundred and forty-four, showed temperatures rang-

ing from 68 to 72, with most of these at 70, which seems to be accepted standard temperatures for the American schoolroom where any attempt is made to regulate carefully the amount of heat in the room. A lower temperature would doubtless be better for all concerned."

In New York schools Winslow (35, p. 226) reports: "We found schools in which the temperature in one school day ranged from 53° to 81°; schools in which a third of all the records obtained were over 71°; schools in which the temperature for several successive days was almost constantly between 75° and 80°."

In some parts of the country many rural schools have no thermometers. In 1912 Dr. Dresslar (14, p. 12) reported that of 1,296 typical schools scattered over nineteen states two-thirds had no thermometers, and in the remaining one-third it was clear that many teachers knew next to nothing about keeping the schoolroom at a proper temperature, or else the conditions were such that they could not maintain an even temperature.

We may perhaps conclude with Supt. Hines that with the right condition of humidity 68° is the proper temperature for a schoolroom. The practice in certain large cities is in accord with this standard. According to official regulations, the schoolroom temperature in Chicago and New York should be 68° instead of 70° as formerly. Tests in English schools (14) indicate that the best work can be done with a temperature in the sixties; and the outdoor schools bid fair to furnish evidence that the optimum temperature for school work is not above 60°. At present, for indoor schools 68° may well be taken as the maximum limit.

In many cases the overheating is a serious handicap upon school work. A case reported to me recently, by an intelligent school visitor was, as I recall it, in substance as follows: Both the teacher and the children had become nervous, school exercises went awry, the discipline and morale were failing, the school work both to the teacher and pupils was of little or no value from an academic point of view, but distinctly injurious from the point of view of hygiene. The teacher seemed to be a good one. The cause of the trouble was obviously the high temperature of the room, 75 or more. This is merely a typical case. What is needed in such schoolrooms is not better discipline or more efficient methods, but chiefly a mere reduction of the schoolroom temperature. The condition of the ordinary schoolroom in this part of the country as regards temperature, not to mention minor matters such as school dust, bad odors, and the like, is often unpardon-

able. The one reform which perhaps more than any other, except possibly greater cleanliness, is obviously needed in our schoolrooms, is a lower temperature. And when we reflect that decreasing the heat would not only increase the efficiency of the school work but decrease the money paid by the taxpayers, the question why this reform is not brought about remains one of the puzzles of school hygiene, and can be accounted for psychologically only on the basis of the force of custom and the power of the law of inertia. It is, however, a difficult thing to obtain a suitable temperature in a schoolroom. In the first place, it is very difficult to arrange the system of heating and ventilating so that excess of temperature can be avoided. In the second place, lack of proper humidity makes children feel chilly even in a room with high temperature. Again, the carelessness and lack of hygienic apperception on the part of teachers is such that they often work in a room with excess of temperature without realizing it. And finally, and sometimes worst of all is the ignorance and inertia of janitors.

The report has come to me of a janitor in a rural district who complained that he could keep the school room at the proper temperature all right if the teachers did not keep moving the thermometers about. In spite of all difficulties, however, the teacher should keep watch of the temperature, and if unable to regulate it herself report to the janitor or principal. If the overheating is not remedied, the teacher should report again, and keep reporting and protesting until that janitor, although he fear not God nor regard hygiene, may be wearied with her continual coming.

The following significant results seem to be established by the investigations thus far.

(1) The body temperature in a condition of health is approximately 98° F., although with slight individual variations.

(2) The body temperature varies rhythmically during the day, being lowest in the early morning, perhaps from 2 to 5, and increasing during the day and reaching its maximum in the afternoon, perhaps between 3 and 6, with a fall at night.

(3) The body temperature varies also with the external temperature and with the clothing. The New York Commission for example, found that the morning temperature was in a considerable degree determined by the temperature of the preceding night, and that the temperature was lowered by confinement in an atmosphere of 68° F. and 50% relative humidity, and raised by confinement in an atmosphere of 75° F., and still more with an atmosphere of 86° F. with 80% humidity.

(4) No considerable variation from the normal temperature can occur without serious results. It is vitally essential for the welfare of the organism to eliminate superfluous heat.

(5) There is apparently an optimum temperature for all forms of activity, whether in lower organisms, animals, or man. For physical activity in man this is perhaps a temperature of outdoor air of 60° F.

(6) There seems to be an optimum temperature for mental activity; this perhaps for the outdoor air, 40° F.

(7) The optimum temperature is different for different kinds of activity. The higher the organism the lower seems to be the optimum. The higher the form of activity, the lower apparently the optimum. The optimum for adding, for example, is distinctly lower than for muscular activity.

(8) With a temperature below the optimum the metabolism is not sufficient for the most efficient activity.

(9) With a temperature above the optimum the activity increases to such a degree that the organism is not capable of carrying on the necessary oxidation processes and of removing the waste products from the body with sufficient rapidity. These waste products act as poisons and diminish the activity, and fatigue quickly occurs.

(10) The temperature seems to be the most important climatic factor in its influence upon comfort and activity both physical and mental.

(11) Change from a high temperature to an atmosphere considerably colder, tends to render the organism susceptible to infection, as indicated by experiments upon rabbits.

(12) The primary purpose of ventilation is to maintain an optimum temperature.

(13) Considering the condition as regards temperature in most American homes, the optimum temperature for a schoolroom seems to be about 68° F., with a relative humidity of about 50 per cent.

(14) The regulation of temperature is the most important condition for intellectual workers whether in the schoolroom or elsewhere. In many schools probably no condition is so injurious as the excess of temperature that usually occurs, and no schoolroom reform would do so much for comfort and efficiency and health as care to keep schoolrooms continuously at an optimum temperature.

(15) While, as indicated by the investigations of the New York Commission, under laboratory conditions, excess of temperature may not specially diminish the amount of mental work done, under schoolroom conditions the discomfort caused is likely to have a marked effect.

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SCORE-CARD FOR RATING STUDENT-TEACHERS IN TRAINING AND PRACTICE

By H. A. SPRAGUE, Supervisor of Practice, State Normal School, Newark, N. J.

The purposes for making a score-card for rating student-teachers in training and practice are as follows:

1. An analysis is presented of the qualities necessary for successful teaching and of the relation of these qualities to one another.

2. In the hands of student-teachers this analysis will tend to promote self-criticism and self-improvement.

3. In the hands of critic teachers this analysis will tend to promote their comprehensiveness of judgment in rating students' teaching efficiency.

4. This outline may be used by critic teachers as a score-card for rating student-teachers in such a manner as to give a reasonable proportion of credit to each of the fundamental qualities.

5. These ratings should designate points of strength and weakness in the student-teacher and should therefore prove valuable in guiding the principal, the supervisor, and the critic in their constructive work with the student-teacher.

6. The records on the score-card may be used as a basis for recommending graduates for appointments.

The qualities of merit enumerated on the score-card are organized about four main topics:

I. Preparation.
II. Teaching Skill.
III. Classroom Management.
IV. Personality.

These topics were adopted after inspecting the studies of Boyce,[1] Miss Moses,[2] Ruediger and Strayer,[3] Boyce,[4] Littler,[5]

[1] Qualities of Merit in Secondary School Teachers. *Journal of Educational Psychology,* March, 1912.

[2] Causes of Failures Among High School Teachers. *School and Home Education,* January, 1914.

[3] Qualities of Merit in Teachers. *Journal of Educational Psychology,* May, 1910.

[4] Methods for Measuring Teacher's Efficiency. *Fourteenth Yearbook of the National Society for the Study of Education,* Pt. 2, pages 11-20; 42-76.

[5] Causes of Failures Among Elementary School Teachers. *School and Home Education,* March, 1914.

Buellesfield,[6] Elliott.[7] It is not possible to determine, with mathematical accuracy, the importance of the topics used in these different studies: first, because of the various meanings given to the different terms by different authorities; and second, because of the length of the lists of topics in several of the studies. It is interesting, however, to note that the topics commonly used in each of the above studies were, with but one exception, the qualities enumerated above. I therefore decided upon the use of these four topics and have organized about them the other topics given in Table I.

Though the studies just mentioned were helpful in deriving sub-topics for each of the main headings decided upon, the most valuable means of obtaining these same sub-topics was a study of the preliminary reports made upon student-teachers in practice by critic teachers or general supervisors. The records of three hundred twenty students were examined and the personal criticisms contained were classified under the topics of I, Preparation; II, Teaching Skill; III, Classroom Management, and IV, Personality. This classification was a rich source of suggestion for the sub-topics used in the finished score-card. It did not however strongly emphasize the use of certain topics, as, for instance, I, B; I, C; III, B; III, C. The distribution of these personal criticisms and their bearing upon the score-card is shown in Table I.

TABLE I

I.	Preparation	47
	A. Lesson plans	33
	B. Daily or weekly plans	9
	C. Use of course of study	5
II.	Teaching skill	277
	A. Stimulation of interest	81
	B. Thought and response	58
	C. Drill	42
	D. Economical use of time	51
	E. Results	45
III.	Classroom management	101
	A. Organization of class	39
	B. Care of room	10
	C. Discipline	12
	D. Clerical work	40
IV.	Personal fitness	127
	A. Physical	43
	B. Progressiveness	13
	C. Manners and morals	19
	D. Sociability	52

[6] Causes of Failures Among Teachers. *School Administration and Supervision*, September, 1915.

[7] Same as 4.

The topics presented in Table I are resolved into questions (see score-card at end of the description), because questions may be more definite in their reference and also more stimulating to the critic teacher who may use this score-card.

After the score-card was prepared for the first time, it was often submitted for expert criticism and consequently, it was under continual revision for a course of several months. After a set form was decided upon, judgments were obtained as to the relative importance of the main topics and major sub-topics.

Method of Obtaining Judgments

One hundred eighty-three score-cards were distributed personally to as many different judges at different times and personal instructions were given as to the manner of distributing one thousand (1,000) points: first, among the Roman numeral topics, and then as to the manner of redistributing them among the respective sub-topics. The oral instructions were in substance the same as found in the following circular letter. One hundred seventy letters were afterwards distributed among as many other judges. Each letter contained a copy of the score-card and the letter of instructions detailing as to the method to be followed in scoring it. The contents of the circular letter reads as follows:

New Jersey State Normal School, Newark, N. J.

Dear Sir:

Kindly find enclosed a list of questions organized under four topics which, though simplified in form, cover the qualities of a teacher with a fair degree of thoroughness. Educators have expressed and often express their individual judgments as to the importance of certain factors listed here in question form. In order to promote uniformity of judgment and the professional welfare of our students in practice I am asking you to co-operate by giving me your personal judgment as to the relative value of each of these qualities of merit. Through an organization of the judgments of a few hundred experts in education it may be possible to arrive at a more definite standard and perhaps to devise a practical score-card for use in judging normal school students in training and practice.

In making your judgment of the relative value of these qualities will you be good enough to use figures, that it may be possible for me to derive a scale of values. Working upon the basis of 1,000, first distribute 1,000 points among the four topics: I, Preparation; II, Teaching Skill; III, School Management; IV, General Personal Fitness. Secondly, take whatever value you have assigned to I (Preparation), and distribute it among the A, B, and C topics. Kindly use the same method in distributing the credits for the sub-topics under II, III, and IV.

For instance, in judging the qualities of a building to be used for school purposes one may make a practical distribution of 1,000 credits as follows:

I. Site. . . . . (125)
A. Location. . . . . (55)
1. Accessibility. . . . . (25)
2. Environment. . . . . (30)
B. Drainage. . . . . (30)
1. Elevation. . . . . (20)
2. Nature of soil. . . . . (10)
C. Size and form. . . . . (40)
II. Building. . . . . (165)
III. Service systems . . . . . (280)
IV. Classrooms. . . . . (290)
V. Special rooms . . . . . (140)

The importance of each of the topics suggested by the enclosed questions has been scored in from fifteen to thirty minutes. After giving your expert judgment, kindly return in the accompanying envelope with or without signature.

Thanking you very kindly for your co-operation, I remain

Very truly yours,

One hundred eighty-seven score-cards from the total of three hundred fifty-three were returned for examination. Only one hundred thirty of this total were used. Papers were rejected largely on the basis of faulty calculation in the distribution of scores or because of incompleteness. Among those who submitted their judgments on the relative value of the topics on the score-card were State, County, and City Superintendents, School Principals, and Critic, and Practice Teachers.

Medians and Deviations

Since the scores allotted to topics I, II, III, and IV were grouped about the points of 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, etc., a step of fifty was decided upon, beginning with twenty-six and ending with seventy-five. The series of subsequent steps is found in Table II. The distribution of judgments, medians, and average deviations may be found in the same table. It will be noted, according to Table II, that Teaching Skill is ranked first; Classroom Management, second; Personality, third; and Preparation, fourth. In the case of experienced teachers who may not be required to make definite lesson plans for each lesson taught, the topic of Preparation is commonly included under Teaching Skill. It is not the custom of many of the judges to give such emphasis to Preparation as may seem necessary in preparing a score-card for rating student teachers in practice. It may therefore be surprising to note that the topic of Preparation received as high a median as 204.42 by a group of judges engaged in such varied educational activities.

The scores distributed to the sub-topics centered about 25, 50, 75, 100, 125, etc. The step of twenty-five was therefore adopted, the first one beginning with 13½ and ending with 37½. The distribution of scores to each of the topics, together with their medians, average deviations, and their rank, may be found in Table III.

TABLE II

26– 75	2	..	2	2
76–125	21	..	9	10
126–175	27	..	19	25
176–225	33	7	39	48
226–275	26	16	31	19
276–325	15	31	21	14
326–375	3	26	3	3
376–425	2	32	5	7
426–475	1	6	1	..
476–525	..	10	..	1
526–575	..	1	..	..
576–625	..	1	..	..
626–675	..	..	..	..
676–725	..	..	..	1
Median	204.42	357.57	227.16	210.85
A. D	27.5	60.99	58.96	57.51
Rank	4	1	2	3

By using the steps of 50 and 25, I found it necessary to correct slightly the median values so as to make them total a thousand (1,000) points. Only the corrected medians are given in Tables II and III. These median values are given in such numbers as would be cumbersome to use; as, for instance, I, Preparation, median 204.42. For the sake of convenience, this number has been approximated by the use of 200. Each of the medians has been approximated in like manner and the scores thus derived are given on the first page of the completed three-page score-card.

TABLE III

	I-A	I-B	I-C	II-A	II-B	II-C	II-D	II-E	III-A	III-B	III-C	III-D	IV-A	IV-B	IV-C	IV-D
13½– 37½	12	44	32	2	9	30	23	18	34	57	78	5	26	41	48	39
38½– 62½	20	51	58	30	36	73	65	37	53	54	44	25	54	53	56	49
63½– 82½	25	24	26	35	32	19	24	28	28	13	8	30	25	18	14	25
83½–112½	40	9	10	46	40	7	14	37	15	5	..	45	23	15	12	11
113½–137½	7	..	3	5	7	..	3	2	..	1	..	6	..	..	..	1
138½–162½	15	..	1	10	3	1	..	5	..	..	..	10	1	..	..	4
163½–187½	2	..	..	1	1	..	3	..	..	..	..	2	..	..	..	..
188½–212½	8	1	..	..	2	..	..	2	..	..	..	5	..	2	..	1
213½–237½	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..
238½–262½	..	1	..	..	..	..	..	1	..	..	..	1	..	..	..	..
263½–287½	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
288½–312½	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
313½–337½	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
338½–362½	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Median	95.64	52.24	56.54	90.37	82	53.5	56.25	75.45	55.92	44.1	35.63	91.51	58.28	51.15	48.16	53.26
A. D.	29.9	15.8	117.9	34.9	25.4	13.2	18.42	29.34	18.6	16.26	13.7	36.6	22.6	22.8	15.3	21.61
Rank	1	13	9	2	4	11	7	5	8	15	16	3	6	12	14	10

SCORE-CARD FOR RATING STUDENT-TEACHERS IN TRAINING AND PRACTICE

	Total points	Poor	Fair	Good	Very good	Excellent
I. PREPARATION	200	below 140	140–154	154–168	168–182	182–200
A. Lesson plans	95	" 66	66–73	73–80	80–87	87–95
B. Daily or weekly plans	50	" 35	35–39	39–43	43–47	47–50
C. Use of course of study	55	" 38	38–42	42–46	46–50	50–55
II. TEACHING SKILL	360	" 252	252–279	279–306	306–333	333–360
A. Stimulation of interest	90	" 63	63–70	70–77	77–84	84–90
B. Thought and response	85	" 59	59–65	65–71	71–77	77–85
C. Drill	55	" 38	38–42	42–46	46–50	50–55
D. Economy of time	55	" 38	38–42	42–46	46–50	50–55
E. Results	75	" 52	52–58	58–64	64–72	72–75
III. CLASSROOM MANAGEMENT	230	" 161	161–178	178–195	195–212	212–230
A. Organization of class	60	" 42	42–46	46–50	50–54	54–60
B. Care of room	45	" 31	31–34	34–37	37–40	40–45
C. Discipline	90	" 63	63–70	70–77	77–84	84–90
D. Clerical work	35	" 24	24–27	27–30	30–33	33–35
IV. PERSONAL FITNESS	210	" 147	147–163	163–179	179–195	195–210
A. Physical	60	" 42	42–46	46–50	50–54	54–60
B. Progressive	50	" 35	35–39	39–43	43–47	47–50
C. Manners and morals	45	" 31	31–34	34–37	37–40	40–45
D. Social fitness	55	" 38	38–42	42–46	46–50	50–55
Totals						

I. Preparation.

A. To what extent is the teacher efficient in planning individual lessons?

1. Is the aim of each lesson definite?
2. Is suitable and adequate teaching material selected?
3. Are the essential values emphasized?
4. Does the teacher plan to present materials and facts in their natural sequence?
5. Does the teacher plan suitable methods of presentation and drill?
6. Does the teacher plan suitable class or individual assignments with periods and methods for studying same?

B. To what extent does the teacher make satisfactory daily, weekly, or monthly plans?

C. To what extent does the teacher show ability to make independent and intelligent use of prescribed course of study?

II. Teaching skill.
- A. To what extent does the teacher stimulate interest?
  1. Is the teacher active, forceful, and inspiring?
  2. Does the teacher illustrate the facts taught?
  3. Does the teacher use the pupil's responses?
  4. Does the teacher use worthy motives?
  5. Does the teacher vary her methods?
- B. To what extent does the teacher train the class to be thoughtful and responsive?
  1. Does the teacher promote earnest discussion, supplementing, verifying, and questioning, by individuals of the class?
  2. Are the questions asked, thought-provoking and thought-directing?
  3. Does the teacher require logical responses and from each individual of the class?
- C. To what extent does the teacher show skill in drilling facts and knowledge?
  1. Are the methods and devices varied?
  2. Are the facts drilled by relating them to other thoughts or life situations?
- D. To what extent does the teacher economize time and energy?
  1. Is the aim of each activity clear in the minds of the pupils?
  2. Is the whole class kept at work throughout work periods?
  3. Are students taught to use books and how to study?
  4. Is the work carried on with reasonable rapidity and absolute accuracy?
- E. To what extent does the teacher get results?
  1. Have the pupils learned the facts which the teacher intended to convey?
  2. Do the pupils know how to use information which they have gained?

III. School management.
- A. To what extent has the teacher shown ability to organize a class?
  1. Has the teacher shown ability to classify the students?
  2. Has the teacher shown ability to prepare a class program?
  3. Has the teacher shown ability to reduce routine to an automatic basis?
- B. To what extent has the teacher proven to be a good "caretaker" of the classroom?
  1. Are the best possible conditions as to heat, light, and ventilation maintained?
  2. Is the classroom neat, orderly, and suitably decorated?
- C. To what extent is the teacher prompt, accurate, and neat in clerical work?
- D. To what extent does the teacher show ability to govern the class?
  1. Is the teacher sympathetic and appreciative in working with students?

2. Is the teacher sincere and just in dealing with students?
3. Does the teacher show authority with self-control, self-reliance, firmness?
4. Does the teacher respond to a condition of disorder quickly and tactfully?

IV. General personal fitness.
- A. To what extent is the teacher physically adapted to teach?
  1. Is the teacher physically strong and energetic?
  2. Has the teacher good physical poise?
  3. Has the teacher a good speaking voice?
  4. Is the teacher personally neat?
- B. To what extent does the teacher show native mental capacity and a disposition to progress?
- C. To what extent does the teacher exemplify good manners and good morals?
- D. To what extent is the teacher well fitted socially for her profession?
  1. Is the teacher fundamentally interested in child-nature?
  2. Does the teacher co-operate with pupils in their out-of-school interests and activities?
  3. Does the teacher co-operate easily with co-workers?
  4. Is the teacher inclined to be a leader in social and educational movements for the benefit of the community?

THE GROWTH OF A CHILD'S CONCEPTS

By Cephas Guillet

Seven years ago Professor and Mrs. Chamberlain published in the Pedagogical Seminary* a list of nearly 1,200 words with the meanings given to them by their little daughter when nearly four years old. The same year that it appeared, I asked my own little boy, then not quite four years and two months old, the meanings of some 400 of the words. Three years later I asked him more than 200 of the same words again: and, after three more years, I questioned him regarding the first ninety of the same words. Thus his age for the three experiments was four, seven and ten. The question was always put in the form: "What does *acorn* mean?" or "What is *acorn?*" At four the child had had no kindergarten or Sunday School instruction; at seven he had had kindergarten and had just entered the second grade; at ten he had just entered the fifth grade.

Of the ninety words the four-year-old child proved to have some conception for all but three. For nine of the words he had only a glimmer of meaning. Let us take one of these words and follow the growth of its meaning as indicated by our three cross-sections of the child's mind. As I have studied these naïve meanings, I have felt as though I were looking right into the mind of the child.

For *ankle* he said at four: "it's a head." I interpret this response as showing that the child had a dim idea that the ankle is a part of the body. He has not yet consciously conceived the ankle or any other of his bodily organs (as shown by other answers) as parts of the body, but they are in fact identified with the body in a vague subconscious way and hence have this in common. Such a class-idea or concept I call a *generic* idea to distinguish it from the clear consciousness of class or general meaning, which is expressed by the actual mention of some common element, and which I therefore call a *general* idea.

At seven the child's notion of ankle was still vague; for, on hearing the word, he at once looked down at his foot, then at his hand, and pointing to the knuckles said: "Why! that—that's an ankle." I said no. Then he pointed to his

*Vol. 16 (1909) p. 64: "Studies of a Child. IV. 'Meanings' and 'Definitions' in the 47th and 48th months."

elbow. Again I said no. Then he pointed to his knee, but said: "That's a knee." Finally he pointed to his thigh. Is it not evident, from his pointing to these prominent bones, that he had a vague generic idea that the ankle was some prominent bone or even joint of his body? But the idea is not so vague as it was three years before. It is a more complete idea,—not clear and yet less dim. And is it not interesting that the first movement of his mind was more correct than his later and more consciously attentive efforts? For, when I put the word to him, he at once glanced down at his foot! And is it not apparent that, if asked this question again when a little older, he would clearly indicate the ankle by pointing to it or feeling it, thus expressing a generic idea of the word no longer vague but perfectly clear?

As, however, I did not ask him again for three years, there was time for the growth of a much clearer as well as richer concept than that. He said, in fact: "Well, it's right near your foot: it's right touching, you could say, your foot." Then, feeling his ankle, he continued: "A big hump like a bruise, only it's a bone and hard." Here we have a clearly-defined concept, containing the position, size, shape, hardness and class. Indeed, he puts it into two classes, not only calling it a bone, but using a simile and putting it with bruises into the class "humps." Note also that, in contrast to his state of mind at seven, the more he thinks about ankle now, the clearer the concept becomes. He thus gives evidence of a much greater power of thought than he possessed at seven. His powers of expression have also greatly increased, and here, as in all his other definitions, prove the close and necessary alliance between clear thinking and clear expression.

I may add that I have found several quite normal boys of ten in the fifth grade who still have a very ill-defined notion of the ankle; for they have only a vague idea that it is part of their leg, and some say it is their knee or a part of their knee. And, if an examination were made, children would be found in this vague condition of ideation in regard to a great many things. Let any teacher towards the close of a lesson question his class upon the matters presented, and he will find that many of his pupils are in the stage of generic ideation regarding them. It is probable that about some things we are all in the vague state of mind this four-year-old was in when he said for *ankle* "It's a head," for *bag* "A towel" and for *afternoon* "It means to-morrow, does it?"

The stage of clear generic ideation, which evidently occurred between the ages of seven and ten in the case of the difficult word ankle, I caught the child at in the case of the words

bit, animal, apple, ant, beautiful and beauty, at the age of four. For animal he said: "It means a elephant and a lion and a pig and a Teddy Bear,—a bear, a awful bear!" The various animals mentioned were evidently conceived as belonging to the class animals without the attention being focused upon any common element of the class-meaning, but only upon individual members of the class. The generic idea is evidently a transition stage between the percept and the general idea. The percept is conceived as a particular instance of a class in a concrete, intuitive, subconscious way, before conscious attention is given to the common elements or abstract relations that characterize the perceptual members of the class and are its essential meaning.

When asked the word animal again at seven, the little fellow said: "You mean bird? Any old thing, eh? Well, I think that it's a thing that grows and lives a life." Here we have not merely a general idea but a very well-defined one. It is indeed a classifying idea that he expresses, for he puts the animal into the class of living things. The only fault we could find with it is that it is too broad, including both plants and animals. But it will probably be a long time before the boy's concept becomes so complete as to distinguish these two forms of life. He does not yet do so at ten, for he now says: "It's a thing that God made to help man so he could live and have food and clothing. Isn't that right? That's one reason anyway." Though the concept is no better defined, it has certainly become greatly enriched.

At four, other instances of clear generic conception are

Apple—"I saw a apple as red as an old barn."
Ant—"Means a great big ant, a mother ant."
Beautiful—"Flowers, pink flowers and ice-cream, and, you know, little lanterns (he meant candles), little tiny bits of ones for babies."
Beauty—"Pink flowers and pink ice-cream."
Bit—"O a little bit at a time." (Said after some hesitation and "I don't know what it means.")

The simplest general ideas expressed by the child would seem to be those where the general idea is involved in the association of some common element, namely some quality, object, action or state. Such simple general ideas we shall call elementary general ideas. Two-thirds of the four-year-old's responses were of this nature. For example, in his definition for cane, "A cane is long," a quality is formally associated with the thing denoted by the word. In his definition for bee, "A sting—honey," two objects are associated with the thing. In thirteen cases the child defines what the object does, as

Baby—"Wettin;" *calf*—"To eat—to have cream;" *bear*—"To eat you;" *blackbird*—"To fly: and air means to have the bird's wings fly—swiftly through the air;" *bud*—"To grow;" *beef*—"To cook;" *acorn*—"To pick up in the ground."

On account of the absence of any subject to the verb, one cannot always tell whether the child had in mind action by or with the object, but forty-six of his definitions seem to come under the category of what is done to or with the object. The following are examples:

Bureau—Looking in the glass.
Bone—Bone's for dog. We have a dog we give some bones and gravy and meat. Got that right?
Cage—For lions to get in—growl.
Barrel—To put in clothes and things and apples. Means to put in a barrel.
Bouquet—To put in water; and water means for fishes to put in, and water means to swim in out in Stony Lake.
Boardinghouse—To cook in.
Bowl—To put in cookies to eat, and candies means to suck and chocolates means to eat.
Bead—To put on and wear; you know, those red beads and black beads and yellow beads, pink beads and blue beads and white beads.
Bonnet—To put on for babies.
Bow—To put on under your neck.
Cap—to cover hair.
Camel—To eat—to ride on.
Board—To teeter-tawter.
Brush—I don't know. O, a brush means to eat. I don't know. Means to— What does it mean? Brush means to brush, to brush,—what to brush your boots.
Broom—To sweep dirt. Dirt's not good to eat.
Bible—To read when you have the blessing. I own the schools and churches both.
Birthday—To have toys.
Beans—To eat, and your mouth is to put food in, to put beans and things in.
Bitter—Not eat; means I don't like bitter.
A very neat definition was that for camp: "To go in tents."

We have seen that a very large proportion of this child's definitions at four years are couched in terms of action, a verb in the infinitive being nearly always used, but occasionally a present participle. At this age children's attention is attracted to what things *do*, or what we do to them or in connection with them, rather than to what they *are*. We are not surprised to learn that the child possesses this trait in common with primitive man, many of whose nouns are exactly similar expressions of action to or relating to the things they denote. How long does this disposition continue in the child? At seven I found that, instead of fifty-nine words standing simply for general ideas of action, there are now thirty-seven. The number is still great and it would be interesting to know the further history of the tendency. My present data give no

further light except the fact that at ten this tendency to focus the attention primarily and chiefly upon action has disappeared.

Of the thirty-seven definitions at seven denoting action, twenty-eight tell again what people do to or with the object denoted by the word. For example:

Box—To put things in; something like that box (pointing to one). (Note that he does not merely say "that box," as a much younger child would.)

Bow—Is to put on your hair, especially for little girls, if you're talking about 'em.

Ball—A bill is to throw, to bounce.

Beans—Are to eat, sometimes to boil, if you mean brown beans or whatever you call those.

Candy—To eat—sweet.

There were three definitions telling what is done by the object, as: Arm—"That's what you feel with: that's what to hold the hand." Then there were five telling what is done both to and by the object, as: Bear—"Well, that's just to grow: or sometimes we eat it—red bear—sometimes hunters go out and get some. I haven't, but I know they do that." Finally there is one definition purporting to tell the origin of the object: Beef—"Comes out of a pig. You eat it. It's good, beef is."

The child at seven sometimes, though not often, added to his description interesting details which gave evidence of a widening experience through observation, action or books.

Board—Sometimes to make bread on, and sometimes to walk on, and sometimes make fences with boards, and sometimes make houses with boards, and all kinds of things with boards.

Boat—To sail in and to row in and to paddle in.

Camp—To live when you go out camping; pitch your tent up, that's camping.

Camel—To ride on—to live—drinks lots of water; keeps in his brains or something. Now, don't ask me too hard questions.

At four the child is already sometimes interested not merely in the action but in the purpose of or reason for the action. There are now eight instances of this intelligent interest. The purpose is generally very simply interpreted in acordance with the child's narrow range of experience.

Call—To come here and look at this thing.

Bell—To ring for people to get in and start.

Box—To put in things; cause, if the Indians would get them, then the people wouldn't find them.

Book—To read in; cause, if you didn't read, I wouldn't have any stories.

Black—Not to eat; cause black isn't good to eat. No sir, black isn't good to eat; cause, if you eat black, you don't like it and you throw it away. If you eat ink, you don't like it, do you?

Boy—Has to eat; cause, if the boy didn't eat, he would be hungry all day.

As we should expect, this explanatory tendency is more strongly developed at seven and is liable to be expressed in more general terms. And the purpose may be applied directly to the thing or to the name itself. There are now nineteen cases of this interpretation of the meaning of words of which the following are examples:

Call—Why, when anybody wants you for something, they call you.
Bell—That's to ring,—dinner bell or whatever you mean.
Boardinghouse—To board in; to live in while you have no house.
Clothes—If you didn't have clothes, everybody would see your body.
Cage—To put an animal what's kind of greedy in or he might eat you.
Bib—Is to put around your neck, so no spots or anything'll get on you.
Birthday—Is just to know when you were born.
Buttercup—Some part of the butter. They call that name from the butter cause it looks so much like a butter, shines so much, and is so juicy.
Bit—A little bit. O Gee! O Golly! Don't ask me; I don't know. When you want to eat a *little* bit, I think it isn't good for your stomach!

As the child is naturally so much interested in action in his early years, it is evident that his environment should afford much opportunity not only for varied action on his part but for the observation of other objects in action. Pictures of animals for children should always show the animals doing things and not in the common position of stuffed museum specimens. Gradually also the child should be led to describe and interpret what he sees—both qualities and actions—in clear, simple and correct language. We should strive to keep the child upon the plane of accurate expression of his ideas *all the way up*. The child accustomed to a slovenly expression of his simple ideas will, when grown up, inevitably express his maturer ideas in a similarly illiterate manner; while the child in whom the habit of accurate and elegant expression is early formed, will retain it throughout his life.

To the unthinking, to say "animal," when asked what *bear* is, amounts to the same thing as to say "bear," when asked the meaning of *animal*. Such a person will be surprised that a child does not usually say "Buttercup is a flower" and be done with it, instead of indulging in so much talk about its appearance and its name as did this little boy. But the two reactions really involve very different processes: in the one an image of an example is called up by the mention of the class; in the other the concrete image must call up a general idea. To the child the latter process is much more difficult, because his experience has been very largely concrete, and the habit of generalization is not yet formed. How slow such

a habit is in ripening is evidenced by the fact that at four this little boy generalized in this way by putting the object denoted by the word into some class by the use of a class-name only three times, and in two of these he simply used the word *thing,* as:

Ball—A yellow ball; a old round thing.
Banana—Is a long thing.
Bank—A long grass, a hill with grass, with flowers all along it.

At seven the boy was never satisfied merely to mention concrete individuals when asked to define some class-name; and, on the other hand, he defined an individual by using a class-name far oftener than at four, indeed eighteen times; and at ten nearly everything was put into a class.

At seven the effort was still often crude; witness the following:

Banana—A thing you ought to eat and it grows on a tree; it has a lot of yellow skin.
Apple—Part of a tree, part of an apple-tree.
Bushel—A lot of things.
Bush—A brambly thing. You can't get out of it hardly. Prickly, if you mean rosebush.
Bug—Is a little thing. Bug crawls around, does some little damage, especially a bee stings.
Afternoon—(After much hesitation) Why, that's noon,—noontime.
Black—Is black. I don't know. Is just the same as white, only it's darker.
Bureau—To put your brushes and combs and things on. It's a glass.

The following words were better defined:

Bone—Well, part of an animal, the hardest part it's got.
Bread—Is to eat. Is about the best kind of food you can get in the world,—one of the best.
Applesauce—Is an apple,—tiny bits of apple cut up.
Broth—Soup.
Bud—A young flower.
Calf—A young cow.
Block—You mean a toy? To play with, to build with.
Bouquet—To smell and look pretty. That's a bunch of flowers.
Beautiful—O beautiful; what do you mean? If anything's pretty, that makes it beautiful,—beautiful flowers or beautiful something, flowers especially.

In the definition of beautiful, instead of a class-name a synonym is used.

In these definitions by class-name and synonym we have at last reached a form of definition that is used by the much more mature ten-year-old. Some of his definitions are crude, but they are on a level with the best of the same child at four and seven, while far the greater number are better, and often very much better, witness the following:

Bug—A beetle or some insect.
Brother—A second boy that is born in the same family.
Acorn—Why, it's a nut of an oak-tree.

Clothes—Garments.
Beef—It's the meat of a cow.
Black—The darkest color in the world.
Breakfast—The first meal of the day.
Afternoon—The latter part of the time when it's light. Or about after dinner, you could say.
Book—A book is a lot of pieces of paper sewed together and an outer covering and a name on it; and it tells you something; and on each one of the pages has some writing on it, unless it is a picture. Ha ha!

The little laugh with which this last definition closes sounds like a triumphant exclamation; and, indeed, not only that definition, but most of those I have cited from the ten-year-old could hardly be better either in idea or in form. Is it not evident, then, that at ten this child was quite capable of classifying objects accurately, and that for him the time has arrived for the serious scientific classification of natural objects, and not merely the "nature study" observations, too often very meager and superficial, which alone engage the attention of pupils at this age in our schools, and fail to rouse the active interest of an eager child? Is it not evident also that at this age a teacher may fairly expect from such a child, and encourage in him, clear definitions of the things that come within the range of his interest and experience?

The classifying definitions containing additional details of an interesting descriptive or explanatory nature are only ten at seven years, but very numerous at ten, seventy per cent of the words being thus fully defined at this age. Some of the explanations at seven are very crude; but others, particularly those regarding acorn, ant, baby and bible, show considerable power of analysis and reflection. That for animal has already been given. The other nine are as follows:

Bee—Well, that's a thing that makes honey, that lives and makes its honey out of clover and some other kinds of flowers; I don't know,—lilacs sometimes.
Boy—He's God's young sheep, one of God's sheep, God's young sheep, a lamb.
Bank—You mean a little hill or a bank to keep money in? (I said the hill.) How could you live? How could you walk? There'd be a great big hole if there wasn't a bank there.
Apron—What a woman puts on around her waist to protect her from any old spots and things to get on her dress.
Ant—It's a little thing that crawls all over the ground to find its way.
Bible—That's only a thing to read out of, to know what God is and know about God.
Back—Is a thing that you want to lie on. If you didn't have a back, you couldn't live. Everyone would look at you and see inside you. Back helps you to grow. Whole thing gets bigger when the back gets bigger.
Acorn—The life of a tree. You can plant a acorn.
Baby—A baby is just a thing that's starting to grow. It's a little seed at first, and then it comes up and sprouts and sprouts to big.

At ten years thirteen of the meanings contain rich descriptive content only, while fifty-three of the ninety words are defined with explanatory comment added to the descriptive. I shall quote a few of these which fairly illustrate their character:

His definition for *bread* is almost Rabelaisian in its flow of language and free use of synonyms: "Is made of flour. The first process is wheat. You thresh her up and clean her out and get the chaff out, that is the hull sort of. And then they splash, bang and grind her up, make white stuff called flour. And they take the flour and put water with it and make something that is called bread. Guess they have to bake it, only I thought you'd know that."

His interest in Indians is betrayed when he comes to define *blanket.* —"Is something made of wool or cotton woven, very thickly woven with machinery. It is to put around you when you go to sleep or when you're cold. Some Indian squaws wear the blanket all the day round. Usually modern people use it only in the nighttime to wrap themselves in and keep warm."

In defining *boy* he indulges in a curious bit of sly criticism:—"A boy is a human being and can walk around, and he is the young of a man, and when he grows up he is a man—usually."

His neat definition of *camp* now indicates a rich vacation experience:—"Is a place where only tents are used. It is a place where you stay for a day or a week. People do not stay long in camps. A camp is one or more tents put in one group. It is on the bank of a river or woods. They do not usually have camps in cities but just in the wilds. Sometimes it is not a tent but just a few branches over a limb to keep from the rain. You might say a camp is a shelter."

His fondness for boating and for boats, which he likes to draw, is quite apparent in his loquacious definition of the word *boat,* as well as his keen interest in the war.—"Is a lot of boards nailed closely together so the water can't get at them; and it is shaped like it is round at each end and comes up to a point at the top. And some boats have keels and some haven't. And there are all sizes of boats. And they are made of wood or steel or maybe iron. And there's a lot of different kinds of boats. Canoe goes by man's hand,—paddle. Steamboats go by steam. The motor-boats go by gasoline-engine. Row-boats, they go by the oars that you pull,—man's hand. And there are flip-flops that are used in swimming. There's the submarine that goes under water; there's the warship that goes on top of the water; and there's the little torpedo-boats. There are sail-boats of all descriptions; and there is one big boat that is called a torpedo-(*destroyer* was the word he was trying to recall). They all go in some part of the water."

His full descriptions of animals show his interest in observing and reading about them. I shall quote two of these. "A *bear* is an animal something like a dog only it is larger and has thick fur and short claws and is a great fighter. I think it is one of the hardest fighting animals in the world." "A *camel* is an animal of the desert and it has one or two humps on the back. The hump looks like a little tiny mountain. The humps are from two to three feet high. The camel's eyes are very strong so that he can stand the sands of the desert. He has a very long neck and legs, but not so long as the giraffe. It is colored brown. The eyes are so strong that it can see a long ways; and, if it sees a storm of sand coming, it always

crouches down so its master can get off and get behind it. Its eyelids are so thick that the sand can't penetrate through them, no matter how hard the sand beats upon them. It is a great protection to the Arab, for the Arab gets behind it always in the storm."

He several times tried to be mathematically accurate, as in his definition of buttercup.—"O, flower the color of butter and shaped like a cup, and about a tenth as big, if the bowl is five inches across at the top." Other instances are his description of a barrel as being "three feet high," of a baby as "just like a man, only about one quarter as big," and of a ball as being "as round as anything can be; every edge is as far from the center as any other edge."

His use of simile is interesting; it occurs some twenty-five times now. There were but two or three instances at four and at seven. A notable instance at ten was his likening the backbone to a tree "cause it's got a whole lot of branches."

GROWTH IN THE CONCEPTION OF NINETY WORDS

Age	4	7	10
No content expressed	3	0	0
A vague generic idea (value one mark)	9	2	0
A clear generic idea (one mark)	6	0	0
An elementary general idea (two marks)	61	37	0
An elementary general idea with rich descriptive content (three marks)	0	4	0
An elementary general idea with explanatory content (three marks)	8	19	0
An ill-defined classifying idea (value four marks)	2	8	0
A well-defined classifying idea (five marks)	1	10	24
A classifying idea with rich descriptive content (six marks)	0	3	13
A classifying idea with explanatory content (seven marks)	0	7	53
Relative score in percentage of age ten	30	52	100
Relative number of words used in percentage of age ten	25	38	100
Relative number of *different* words used in percentage of age ten	29	37	100
Average number of words for each definition	7	12	32
Average number of different words for each definition	2.6	3.3	8.9

In defining the ninety words the boy at four used 734 words, at seven 1,105 words and at ten 2,904, so that his definitions contained at four on an average seven words, at seven twelve words and at ten about thirty-two. The number of *different* words used at each age was respectively 230, 298 and 796. During the whole investigation the boy used 944 different words. At four he used 85 and at seven 81 words that he did not use at ten. Only 15 of these were the same in both cases. At four he used 113 words not used at seven and at seven 178 words not used at four. At ten he used 651 words not used at four and 579 not used at seven. Words

beginning with the letters *b* and *s* were much the most numerous. Assigning marks to the different degrees of conception, as shown in the table, I reckoned that at four the child gained 173 marks, at seven 294, and at ten 569 out of a possible 630, if all the words had been very clearly and fully defined, that is, if the concepts had been expressed correctly and with a rich descriptive and explanatory content. Expressed in percentage of his ten-year-old achievement, the boy at four made a score of 30 in value and at seven of 52; in number of words at four 20 and at seven 37; and in number of *different* words 29 at four and 37 at seven. To express his rich content of experience the ten-year-old naturally needed a rich vocabulary. Larger experience is accompanied by fuller vocabulary and greater powers of expression.

In a few cases at four years, notably *bear, beef* and *bread,* after defining the word as best he could, the little fellow wandered on rather excitedly and, particularly in one case (*beef*), irrelevantly. The following instance was due chiefly to fatigue, which acted as an irritant:

Bread—" To eat. Everything means to eat except blocks and except cuffs and or inks and cept papers and cept writings and cept street-cars and cept butterflies. Not pens are to eat or trees are not to eat. I'm kind of weeping now, but I'm not tired. No, I'm not tired a bit, but I'm just kind of weeping my eyes."

That evening he gave thirty-seven meanings in fifteen minutes (from 6.53 to 7.08 p. m.) and *bread* was the thirty-fifth. Even after the thirty-seventh he insisted that he was not tired and was anxious for me to proceed. In defining the interesting word *bear,* an aroused imagination partly accounts for his uncontrolled impulse to talk, but fatigue contributed here also, as it was the twelfth word asked him after supper one evening and he gave other signs of being tired.

Bear—" Means to eat you, and lions will eat you. If you get by horses, they'll eat you and kick you and everything. If you get by tigers and lions and elephants and bears. You know those Indians used to be wild, but they don't now."

But to return to our statistics, in whatever way we regard the matter, it is quite apparent that this boy was at seven much nearer his four-year-old mentality than his ten-year-old. That is, there was a much greater growth of conception and power of expression between seven and ten than between four and seven. Indeed the four-year-old definitions have only in three cases a resemblance to those at ten, while the four and seven year old definitions come under the same categories in all but a few cases. Comparing seven with ten also, we find only twenty words defined at seven according to ten-year-old

standards. At ten the child defines his words clearly and in general terms, beginning by putting the object of thought in its proper class, and then entering upon a fairly orderly description with explanatory comment. He mentioned the materials of which the object is composed in 28 cases, the structure or process of making in 14, the parts in 14, the shape in 14, the size in eight, the color in eight, and the flavor in six cases.

In view of this wealth both of descriptive and of explanatory content at ten in the concepts of this boy, he has evidently made great progress in the interpretation of experience. For explanation involves higher mental processes than description: the one involves the understanding, the other the reason. Training in wide and accurate observation and in well-reasoned explanation, therefore, should now proceed hand in hand, the latter based squarely upon the former. I have no doubt that this very investigation acted as a spur to the powers of accurate observation and expression of this little boy, although he was not once corrected or taught anything or even encouraged to go on talking. That the work was oral was an advantage: for oral expression is more free and natural than written, especially to the child, for whom writing is so slow a process. And surely for a child to tell the meaning of words in his own words, or even to use them in their proper setting, is a better exercise than hunting up words in a dictionary. This child's answers were given with a promptness and a zest and an originality that could not have been present to the same extent had he been made to write them.

It may be objected that this is a one-child psychology. But one need not be too much disconcerted by such a remark. Children are, each and every one of them, children, both physically and mentally, and, though they differ in precocity and rapidity of growth, it is not probable that the facts concerning the order of growth, whether physical or mental, discovered in one child, will be materially contradicted by those found in another. And I have good reason to believe that the study of a single child is the best kind of preparation—I had almost said essential as a preparation—for the mass studies that have been but too lightly entered upon in the past. Let me illustrate the point by referring to a mass-investigation on this very subject,—one conducted not by a tyro but by one of our leading investigators of childhood, one to whom, indeed, we all owe much inspiration.

Some years ago this gentleman[1] issued a questionnaire addressed to teachers in London, England, and in Boston, Mass.,

[1] Earl Barnes: "How Words Get Content," in California Studies in Education, vol. 2 (1902), p. 43.

requesting them to have their children write out meanings for the six words *monk, peasant, emperor, armor, nation* and *school.* Studying the 2,700 returns, the investigator discovered what he called "a general law of development," namely, that, in their growth towards complete conception in the child's mind, words pass through the three successive stages of *no content, wrong content,* and *partial content,* and we are shown tables and shaded charts which are supposed to demonstrate this law.

Not long after this law was thus announced, another man undertook to investigate the same subject in the same way and with the same words. With the coöperation of teachers he secured the same number of returns from the schools of the Middle West. And this investigator rediscovered the very identical law of development that his predecessor in this field had hit upon. And he constructed from his tables even more beautiful charts to picture what he called "the sweep of the crest of the wave of development." "The curve of *wrong answer* for *monk,*" says this investigator,[2] "represents the number of children of each age who have seen or heard the symbol but have associated with it wrong ideas. It is significant that this curve rises almost as rapidly from six to ten as the curve for *no answer* falls. This *wrong answer* tendency is intermediate in the evolution of the concept between *no content* and a *correct content.* Many children, who, at six or seven, have not heard the word *monk* used, at eight or nine recognize the symbol but associate wrong images with it, or confuse it with other words that have a similar sound. Thus 'Monk is a monkey' or 'Monk is a chipmunk' show such confusion through euphonious analogy. The ages eight to eleven are especially characterized by this sort of answer. This seems to be a 'hit or miss' period, a time when the child would rather guess than confess ignorance." Note this naïve remark. The investigator builds a general law of development out of the wild guesses of children desperately anxious to answer his questions!

Now, I have to confess that I have found no evidence whatever of this "general law of development." In giving the meaning of one of the words, my little subject said *bushel* meant "to grow." The word that preceded *bushel* was *bush,* and to that he had responded "to grow," so that his answer showed, not that he really had any wrong association with the word *bushel* but that he never had had any content whatever regarding it, and did not then have any except the purely mechanical sound-association. How absurd it would be to say

[2] W. G. Chambers: "How Words Get Meaning," in Pedagogical Seminary, vol. 11 (1904), p. 39.

that this meaningless guess was "a stage" on the way from *no content* to the true though partial content that he had when next he was asked this word and said for *bushel* "Lots of things"! Moreover, for all the nearly 1,200 words put to the little Chamberlain girl, I have been able to find but one totally wrong definition.

All these gentlemen's tables prove is that there is an age when children, asked the meaning of a word which they do not know, are liable to make a guess at it. It is possible also that this is the age when children are most prone to use words wrongly, being naturally fond of using new words. But during my whole investigation the little subject used only two words wrongly. This was at ten, when he said "obstacle" for *object* and "electric" for *etc.* The word *electric* was well-known to him as he had often used it in such expressions as "electric cars" and "electric light," but he had never seen *etc.* written out and thought it an abbreviation for electric, and so had come to use electric in this sense too. This leaves, out of all the many hundreds of words he used during the course of the experiment, but one word for which he had a totally wrong content. So that this phenomenon is really very exceptional.

The point I am making is simply this: that no one who had carefully studied the growth of conception in a single child could ever have made so gross a blunder in the interpretation of statistical tables as did these two investigators. And does not this show the need of better observation, of more patient and careful observation, and of more training both in observation and in interpretation in our schools both high and low?

At the time of my first experiment with the little boy, namely at four years, I asked his little cousin, then five and a half years old, to tell me some of the meanings. He proved unable to tell what *brush* meant; but, after trying to think and giving it up, saying, "I don't know," he added reflectively: "When you don't know what it is, why you want to tell what to do with it." Is that not an interesting bit of psychological introspection? When a child cannot define a word accurately by putting it into its proper genus and species, then he tells about the action performed by or with the object. That is just what we found. And does it not follow that, if a child *can* give the word a more accurate definition by using a synonym or class-name, he does it? That too we found by examining the replies of the boy at ten. Therefore we are justified in judging of the degree of development by the expression the child gives to his ideas.

Putting it more generally, the little philosopher really meant: "When you can't do something better, you do the best you

can." And the inference is that, when you can do something better, you do it. I like that little boy's philosophy. The person, whether child or adult, who does not do the best he can, all the time, is not normal, is, in fact, a weakling, or on the sure road to becoming a weakling and a parasite. We have here really a statement of the great principle of mental and moral growth. If it were not a true statement, we should not be living in a lawful world; we could not bank on anything; we could form no expectations; and it would not be worth while studying phenomena. But the statement is true; and so we can go ahead with our study, assured that we may arrive at truths and principles universally applicable.

And if this is granted, does it not follow that the only sound basis for efficient action is serious study; and in particular that the only sound preparation for the training of minds is the study of mind; that the only sound preparation for the work of assisting mental growth is to study the facts and laws of mental growth?

What, then, I may be asked, have we for pedagogy here in this psychological analysis? We have first of all the suggestion that, just as in our sleep we are on various levels of consciousness from the deepest dreamless slumber to our waking, so in life we grow from the dim consciousness of infancy to the full, clear consciousness of maturity. Hence education should be a process of *waking up,* of waking the mind up, of bringing it to ever clearer, deeper, fuller consciousness. By judicious observation and interpretation of objects and facts, alternated with reading and conversing about the observation and interpretation of others, the mind is made more suggestible to truth. More and more brain-cells come into functional activity, more and more dispositions and associations are implanted, ready to spring up, at the bidding of slight but appropriate stimuli, and bring with them the new things that lie more or less richly in the depths of every child's consciousness.

In the second place. we have here the beginnings of a new scale for measuring the mental maturity and growth of the child. But such a scale, whatever its value when perfected, would really be of value to any teacher only in proportion as it was used intelligently, only in proportion as the experience gained by those who have devised the scale had become the experience of the users of the scale. The best that psychology can do for the teacher-in-training is not, on the one hand, to provide him with the tests and scales which psychologists are now so busily devising, nor, on the other hand, with rule of thumb methods of handling this or that subject in the curriculum; but it is to give him a state of mind, an atitude,—the

attitude of the intelligent, suggestible learner. No method should be elicited from or imparted to or practised by the teacher-in-training without reflection upon its purpose in the development of the child's mind and its fitness to further that purpose. To ensure this being done there should be the strongest possible correlation between psychology and methods in our normal schools and colleges. The work in methods, including the oversight of the teachers-in-training, should be in the hands either of the teacher of psychology or of one who is also a thoroughly trained psychologist convinced of the importance of psychology to pedagogy.

I have endeavored to suggest how close is the relation of psychology to pedagogy, how essential is the science of the mind as a basis for the art of the teacher. A word should be said about that branch of mental science which deals in a very specific way with the schoolroom problems of the teacher. Experimental pedagogy is a very recent graft upon the old psychological tree. I think one could give in an hour the facts already ascertained by its aid. But its significance, as well as that of child study, lies not in these facts, but in the method by which they have been ascertained. And the teacher who imbibed the facts without understanding the method of investigation would be little better off. I have discovered, by handing my data to untrained normal students and asking them to study the data and write their conclusions out for me, that it all means very little to their untrained and unsuggestible minds. The longest way round is sometimes the shortest way home. The indirect method of approach is often the most effective. If we, in our normal schools and colleges, sought to turn out investigators, we should succeed better in turning out teachers. I look forward confidently to the time when, our teachers having attained the stimulating and vitalizing point of view of the trained investigator, it will be possible to realize what I have formulated as the educational ideal: *Every child its own curriculum; every teacher his own method.*

Shall it be said of the profession of teaching (to adapt a clever reply of Bernard Shaw to his critics): Those who can, learn; those who can't—teach? All the great teachers of men have been also earnest students of man. We all have read how Socrates haunted the market-place to ply his questions. And the discourses of Jesus show how keen and sympathetic a student he was of human nature and especially of the child. So that the ideal teacher was well described long ago by Chaucer, when, depicting the clerk at Oxenford, he said:

> "Sownynge in moral vertu was his speche,
> And gladly wolde he lerne, and gladly teche."

UNIVERSITY RESEARCH[1]

By G. Stanley Hall

A year ago last June our American Universities conferred 556 Doctorates, ten per cent more than the year before. The number has rather steadily increased since 1898, when records began. Since that date, we have created 6,320 men and women Doctors of Philosophy, and have about doubled the average annual output of a decade ago.[2] Each of these 6,320 Doctors, as an important part of his preparation, has produced a thesis which is generally thought by him, and often by the professor under whom it was prepared, to be a new contribution, however, small, to the sum of human knowledge. Some universities require this thesis to be printed, in full or in abstract, in order that the competent may judge somewhat concerning the basis of the degree, and also to give the young Doctor his first inspiring experience of publicity, and make him feel that he belongs to the body of investigators. One bookseller in Germany, where our stress on the thesis came from, sometime ago offered some thirty thousand dissertations for sale, of which I once bought about a hundred and found them helpful in my line, although since in Germany the preparer of a dissertation is in a sense an apprentice to the professor, his work is usually embodied later in the latter's production. Several lawsuits there have, however, given the student proprietary right to own and if he desires to print his own work, although the master under whom it was done has the second claim to it.

Since Mommsen's attack on the Doctor's dissertation, there has been much discussion as to its value, but I can find no sign of its relinquishment by professors in that country. Here the data you have all kindly furnished show the utmost diversity of opinion.

I. Opinions on this subject in the institutions here represented are hard to reconcile. One president of a large state university says fifty per cent of the so-called research in our universities represents an absurdly mechanical process for the grinding out of theses. The president of a large eastern university says nine-tenths of what is called original research in

[1] Address delivered at the 18th conference of the Association of American Universities, Worcester, Mass., November 10, 1916.

[2] *Science*, Oct. 22, 1915; p. 555 *et seq.*

America to-day as represented in theses is not worth doing. Another says that we have laid far too much stress on research, and much of it is beneath contempt. Two think the production of theses is coming to be too much a matter of routine. One says much of this work claimed original has no interest or value in any field. One thinks the thesis element has been overdone, to the neglect of mastery of the subject matter. Another says that it has resulted in a forced stimulation of mediocre men. Four say in substance that we have laid too much stress on research here, one says especially in literary subjects, where philology unfits to teach literature.

On the other hand, another president of one of our largest eastern universities says without the stimulating influence of research as represented in theses our universities would dry up within a generation. Five think we have not stressed the research idea enough in the thesis. One says the man who is not a productive scholar will soon cease to be an inspiring teacher. Another thinks the thesis should not be assumed to be a substantial contribution to knowledge, but should only show that the candidate has acquired the spirit and technique of research, and this cannot be over-emphasized. Another says that enthusiastic students should be allowed to work over old material, if they do it in a fresh way, instead of being expected to contribute to the advancement of knowledge. Another says that the thing to be chiefly considered is the development of the student's mind and that the production of new results should be a by-product. Another says the chief thing should be to throw the scholar upon his own resources and to get his mind into independent activity. Two institutions have a research committee that passes on all projects and makes appropriations for apparatus and publications, to avoid duplication and to weed out weak projects. One reports this has worked well for three years, and suggests an inter-university committee for this purpose. One insists that every graduate student with any capacity should be directed into research channels and those with large gifts should put a larger proportion of their time into it.

As having been responsible for some ninety theses in the last thirty-three years, I doubt if any statement whatever can be made concerning the value of this work that holds for all, or even a majority, of these cases. Not only universities themselves, but departments in the same institution, and even individual instructors in the same department, and especially students themselves, differ immeasurably. As I list my theses, I should say roughly that one-third of them have little value but that the best third do represent something of real, and

some of them permanent, value. Perhaps a quarter have been the basis of the subsequent life-work of the candidates, as has been so often the case, from the theses of men like Schopenhauer and Nietzsche down to President Wilson's "Congressional Government," the outline of which he prepared in Washington in 1883 as a Hopkins thesis. May not the following be suggested as the questions here?

1. Have we instructors given sufficient attention to the wise selection of fruitful, central, stimulating topics, and taken sufficient pains to fit them to the individual interests and abilities of the students? The masterpiece of the medieval apprentice, we are told, was often a joint work of himself and his master; and so should not our theses represent good team-work between the candidate and one or several of his professors? This selection and fitting of topics to the individuality of the student has been compared in importance to the selection of a wife.

2. Have we realized the radical difference between the powers involved in acquiring knowledge and fitting for examination, which represents docility on the one hand, and the active, creative powers that produce, on the other? Some graduate institutions have reported that young men who came to them from colleges where drill and examinations prevailed, and whose marks were high, so lacked trust in their own powers that they had special difficulty in attempting research and in getting their minds into spontaneous activity. One professor says in substance that we must recognize that the graduate student who comes to this work is like a babe just born into a new world, and has at first to be nursed, spoonfed, and helped to walk alone. Royce compares research to play, with the implication that students too inured to a system that over-stresses receptivity are like city children who have to be taught to play, for the joy of investigation he identifies as the play instinct at its best and highest.

3. Do we not go astray if we look solely to the advancement of science in thesis requirements, although this should never be neglected; and does not the higher education essentially consist in finding some kind of ability in each where we can safely give the young man due confidence in himself, without implanting the conceit which is a danger only to shallow minds?

4. Cannon apparently regards this spirit of investigation as the chief criterion of the man who can be truly called educated in our day of specialties and compares at some length the spirit of research to the reawakening of the naïve curiosity of

children which is usually dulled as the "shades of the prison-house" close in upon them. Adler and Janet think that something of this kind is necessary as a palladium of individuality, to relieve young men of the danger of an unconscious sense of inferiority, in the vast world of science to-day, and to give them a wise sense of ignorance, of humility, and their own limitations. One psychologist compares the first experience of research to the first taste of blood to a young tiger, and thinks that the more successful he has been in the special field of his research, the more docile he will be in every other field.

5. If theses are poor, is it not the fault of both the instructor responsible for them and perhaps of the attitude of the institution itself toward research? Have we a right to give fellowships unless we can give a great deal of personal weekly, if not daily, time to each student? It is a principle of the modern charity, which is to-day a science as well as a virtue, that we have no right to give doles to beggars without some agency to follow up each gift and see that the recipient makes the most and best of it. Can an academic teacher assume a greater responsibility than for the initiation of a bright and more or less trained young man into the field of a scholarship that is productive? Are we heads of departments not, therefore, personally responsible for the now many-voiced criticism that young Ph. D.'s are not good teachers, and could this not largely be remedied by a choice of thesis subjects which have at least one large frontier of high culture or at least of great practical value?

II. Should universities discriminate merit on diplomas? Here the answers differ. One university would insist upon three degrees, pass, *cum laude* and *magna cum laude*. Three would have only pass and *cum laude*. Most would not discriminate either on the diploma, the commencement program, or in presentation. Two would develop the English system of passing as distinct from honor courses and grades. Four institutions are uncertain. Eleven make no such discrimination, opinion being perhaps divided. One says that the private, personal commendation of the professor is enough. One thinks the public does not favor such discrimination. One thinks such discriminations good for undergraduates, but would have done with all this in the university. Three think superior men and merit should be signalized in every way. One thinks that superior men should be rewarded only by positions on the staff, another by having special privileges. Three think discrimination bad because it tends to lower the pass requirements for mediocre students. One says it is against the spirit of democracy. One thinks it is impossible

justly to grade thesis work. On the whole the burden of opinion seems rather against it.

The data suggest that one reason for the rather predominant opinion against this discrimination is the desire to escape from the incessant and excessive marking and grading of everything in undergraduate as well as in all school grades, so that the sentiment is in this sense reactionary, illustrating the law of compensation, in which psychology is now so much interested. One argument against this discrimination is that it would cause undue rivalry between departments to have each seeking to show the largest number of Doctorates with honor. If such distinctions are made they might perhaps be referred to such a research committee as Minnesota has established, or possibly made later by some inter-institutional research committee, if such is ever formed.

III. Are young instructors gifted for research sufficiently freed from routine work, examinations, etc.? Here too answers from the different institutions differ widely. No one reports that the conditions in this respect are entirely satisfactory. One says generally so; one not as a rule but often. One says sometimes yes, sometimes no; another that it is hard to answer. One says only a few are so freed; another that they are not always free. One says no young instructor is so overburdened that he cannot investigate. All the rest agree that improvements are necessary here. One large eastern university says this is one of the most unfortunate circumstances connected with the academic career. Such young instructors, fresh from their Doctorates, are full of enthusiasm, but are compelled to exhaust themselves in elementary teaching, examination work, marking, etc., and soon lose their capacity for investigation. Another says that usually we kill creative ability and investigational initiative by overloading instructors of promise. Another says such men are commonly loaded with details who could be more profitably employed in investigation and research, and adds, "I have known good investigators spoiled in order to make poor teachers and vice versa." One president defends existing customs because the beginnings of an academic career should be made difficult to repel weaklings. Many report that such young instructors, as soon as they give sure indications of ability, are favored, either by reduced teaching schedule, by appropriations, apparatus, sometimes absences, and in one institution by increased pay, and in several by more rapid promotion. The overwhelming consensus is that there is here a grave evil which it is very difficult to overcome, owing to lack of funds and to the necessities of teaching. Several jour-

nals have opened their columns to pathetic stories of young men who entered the academic career with high hopes and great enthusiasm, but have been disenchanted and lost all hope of realizing the ambitions that were so strong when they received the doctorate. In one case a young instructor in a large institution was given several hundred sophomores whom he had to teach the same lesson, in three divisions, and did not leave his chair from nine to twelve; he also had to mark four theses, two semi-annual three-hour examinations, and four sprung examinations, for each member of the class. This, of course, is an extreme case. Several institutions insist upon the earliest possible discrimination between those gifted in teaching and those gifted in research, and insist on equal value of these services, equal recognition for eminent success, while two would especially favor those able to investigate.

This problem has some points of analogy with the docent problem in Germany which, since the organization of the docents at Strassburg in 1906, has produced such a flood of pamphlets. It was found that younger instructors on a tentative tenure outnumbered the *Ordinarii* or full professors often three, and in Berlin four, to one, and that they were doing more than their share of the work of the university teaching and often of research, often receiving no pay save fees, with no seat or voice in the faculties, or even in the examining boards, all with academic hopes and expectations, but the majority of them doomed to disappointment. Some of them were the sole representatives of important departments. This academic *Nachwuchs,* as Eulenberg was the first to designate it, was due in that country to the same courses that have brought such a multiplicity of young instructors on a limited tenure to our institutions, namely, to the great and sudden influx of students, the number of whom seems to have about doubled in the last quarter century. After a long and bitter discussion, four leading universities in 1913, led by Göttingen and the projected University of Hamburg, reconstructed their constitutions more or less radically, giving these young men, some of whom had toiled a decade or two (one of them forty-one years) in hope of recognition which never came. Other universities have followed since, so that young men in important departments have equal rights with full professors and others nearly so, and many of these abuses have been remedied. These young men everywhere, as in this country are, of course, the hope of the future. Their ideals are the best material for prophecy. Their enthusiasm and power of sustained work ought to be at its highest and best, and I think no question is more worthy of serious consideration than the

nurture and facilitization of the large and growing body of gifted young men of this class in our American universities. The docent system has been tried in this country, but our conditions make it difficult if not impossible. Perhaps, however, it may be said that if young men of great ability and promise, who represent desirable topics, new or old, were allowed to enter the lists, even competing with senescent professors in their own departments, on anything like equal terms, great good in the way of helpful and needed stimulation and rejuvenation might result in some cases. Are we treating these young men fairly? To fully answer this question would of course involve a discussion of the general methods of instruction and might raise the question whether or not college methods did not follow too much those of high schools, and whether university methods were sufficiently differentiated from those of the requirements of the Bachelor's degree.

IV. What, if anything, is or is to be the result of the war, and perhaps of the changed attitude toward Germany, upon research in American universities? Here I may mention that Mr. A. Hafner, from whom so many of us receive our foreign publications, writes us that "about one thousand French and German periodicals have suspended publication on account of the war, and about fifty per cent of those being issued are reduced in size." He adds that most scientific publications have suffered in quality because so many of their contributors doing research work have been sent to the front, so that the only new research now being done is in the field of medicine. He adds that since March practically all the continental publications have been kept out of this country, that his firm has been able to secure only sporadic copies. I may add that our own list of German publications numbers 193, that we have paid for those of 1916, but not a copy has been received since May 8, 1916. They are lying in bales at Rotterdam and the British authorities refuse the permit for them to be forwarded. Appeal was taken to the British Embassy who referred us to Sir Richard Crawford, the British trade adviser at Washington, who simply told us we could apply and he would forward our request. This we did, but were told that the British authorities would not entertain applications at present. Our situation is doubtless identical with that of all the other universities of this association, so that the question might be raised whether it should consider any action in the premises.

One large university expresses the opinion that it would do Americans good to be separated for a while from the sources that flow from Germany. Eight other universities believe that

this will or should stimulate us to greater activity in investigation, to make good the shortage of intellectual wares made in Germany. One thinks the war has greatly affected our conceptions of the intellectual status of Germany, that American students are feeling that American universities are equal to or better for them. It has made us conscious of our intellectual status. Another says it will lead us to more originality of all kinds; another, we shall stand more firmly on our feet. Another thinks it has stimulated to appreciably greater activity in intellectual research, not only in its relations to industry but in pure science. Another insists that the war throws greatly increased educational responsibility upon American universities for stressing research. This president adds that nowhere has there been such intellectual waste as in German universities, that the war will force us to a new educational work, bring higher standards, and a sense of responsibility hitherto unrealized. Our universities will come into a larger being on account of the European War. Another thinks the opposite effect is possible, that the stoppage of scientific supplies from Europe deprives us of one of our greatest stimuli, and that everything may drop to a lower level in this country as a result. Four insist that American universities have an opportunity now opened by the war that is fully as great as that which it has afforded to manufactures. One doubts whether we shall have insight or ability enough to realize its fruitage and says that the spiritual and intellectual uplift which ought to come now will only be for nations that have the vision and are willing to pay the price of its realization. One insists that scientific research will be incalculably stimulated, that as it has aroused manufacturers to see the importance of scientific investigation in approved fields, and to improve and cheapen methods of production, the same result will follow a little later in academic fields. One believes that the war will make research here far more utilitarian, as war is said to have done in Japan. Another expresses the opinion that if Germany does not continue to lead in research after the animosity toward her, which is sure to be short-lived, is past, we may well fear for the intellectual future of the rest of the race.

It is this stimulus to greater activity that has largely led to the organization of the National Research Council in September, 1915, in the work of which we are all so interested. It proposes "to render the United States independent of foreign sources of supply liable to be affected by war." Some fear that science will be criticized for its part in the war, and it must also repair its damages. In a public address of the

president of one of our institutions he emphasizes the fact that war has created a great opportunity for us. Who, he says, can make good the let-down of the tremendous development of science for which Germany has been responsible? What universities can assume the burden that the great French schools have lain down or that the English universities must forego? The loss of academic talent is incalculable, and to carry on our present standards of life requires a constant stream of vigorous men and a constant outflow of scientific activity from our universities. More and more depends upon this and its cessation means paralysis. We are affected more than any other country, so that there is a new call for our universities to become the center of the intellectual life of the next generation. We must stiffen our intellectual fibre. There must be a more serious moral purpose. Our primary ends should come more to the fore and our secondary interests be less stressed. If the war does irreparable damage to the intellectual life of the world, the primary sources of investigation on which creative work must be done, should be transferred to this country and be developed here. He adds that our universities need a revival of true religion and spiritual ideals, thinks that the war has shown *Kultur* to be a failure, and has shown religion to be ineffective. Hence if our civilization is to stand the awful shock we must go deeper down to the real sources and begin by realizing that our universities have not done their full duty in ministering to the next generation. The intellectual burden of the world must now fall largely upon this country.

Such views are greatly emphasized by present conditions in Europe. Last spring 30% of the teachers in all the German universities were in the war, and even 30% of the courses were suspended, and no less than 64.2% of all students, although registered in the calendar, are *im Krieg*. A Marburg pamphlet say that most of those at home are incapacitated from military service, and even indicates that they are so by their own fault. Still more significant in this respect are the deep and far-reaching changes in all curricula in the direction of immediate practice, not to say material efficiency. We are told that Germany is feeling her school system, excellent as it is, quite inadequate. It is establishing a clearing-house of educational information and practice, suggested by but far more elaborate than our Bureau of Education. The old Suvern Bill is revived, which ensures free progress from the very lowest *Volksschule* to the university, removing the present gap which isolated the *Volksschule*. This proposal, if it prevails, remits all fees from the kindergarten to the Doctorate. Thus a new

type of *Einheitsschule* with a unitary basis but with rich differentiation for different goals is proposed, based not on the pocketbook but on abilities. Some insist that in this way not only will efficiency secure educational rights for women but will even harmonize if not unify military and educational influences. This program, too, entirely severs the control of the church, even from the lower school. In 1890 the Kaiser wished schools to be German rather than classical and these programs realize this wish to an astonishing extent, and it is not uncommon now to read disparagements of ancient culture. Many new courses by professors that remain are introduced, also, in the university, suggested by the war, such as those on the origin and nature of modern *Kultur,* Islam and the Orient, relations of Germany to Christianity and the East, international and military law, economic and other problems of war, pressing needs for economic expansion, and social courses, even on eugenics and child-bearing, while of course medicine has found a vast new field.

In England, too, education after the war is likely to abandon many ancient topics as luxuries, and to become more practical. Greek, it is claimed, should be given entirely to the specialists, and Latin to those who need it and are gifted. Precedents seem likely to be swept away. A plan now likely to prevail makes one modern language obligatory, preferably French, even in the popular schools. Geography is to be expanded but made mainly commercial. History is to be more modern and contemporary. German, we are told, will be neglected for a time, but should be diligently encouraged "in the interests of future harmony." History will be economic and biographic, with great attention to political institutions. Education will have to be practical because the national resources have been mortgaged for so long a future. The war will not end with peace and the schools must begin where the armies stop. In a recent Parliamentary discussion, Lord Haldane insisted that the schools should stress science if they wish to give England the skill which had made Germany so dangerous even before the war as a competitor, while Lord Cromer and Bryce objected that in Germany alongside its material efficiency had been a deterioration of character due to the turning away of the younger generation from humanistic studies. In this spirit the government has appointed a committee of the Privy Council for Scientific and Industrial Research, and also an Advisory Council to propose schemes. To encourage this kind of research the committee proposes 350 scholarships each year for students of the secondary schools who intend to pursue scientific or industrial subjects

in the university, these scholarships to last three years and the estimated cost of this entire movement is placed at 339,000£. Special effort is to be made, too, to detect talent early. This Council is in the line of, if not suggested by, the Kaiser Wilhelm Society of 1910, for the further advance of science in institutions of research, and this has lately resulted in the establishment of a Research Institute on a large scale in Berlin with Emile Fischer at the head.

Must we not infer from all the great new developments of the last few years in this field that the attitude of American universities toward research is a question that overtops all others and requires a new and wider orientation than we have yet given it? The Association of American University Professors is demanding complete academic freedom, and it is very fair and proper to press upon them the question what they are going to do with this freedom when attained to their satisfaction. So to the university in this country, which has existed only since 1876, and is now progressively attaining proper differentiation from the college, the question is what we are going to do. This is too vast a question for any individual or perhaps any single institution to answer, but must be wrought out by the slow consensus of the competent. Can the university free itself sufficiently from the old traditions of the college and learn to give not merely opportunity, but what is far more important, incentive, to research, which is so important a function? I see no way but to give to each department a degree of autonomy and independence of administrative control unknown on the college level. The revolt against presidents and deans a few years ago was largely led by professors of high university grade who were right in defying undue central control. So, too, rules of one department often do not apply to those of another, and there is not infrequently a tyranny of the faculty majority. One university in this association requires only a minimum of two hours a week teaching, and this has worked well for a quarter of a century, and most if not all of the instructors, save those who are new to the business, do more. The great problem is, will men given all this liberty and opportunity keep up their initial ardor for productivity, or sag toward a Carnegie pension or Osler chloroform, crossing the dead-line, so broad that it is hard for their colleagues and even themselves to realize that they have done so? Research is indefinitely harder than almost any amount of teaching. One writer says that the investigator must constantly keep himself in a state of exaltation, illustrating James's "higher powers of man," and that having once tapped these great reservoirs of enthusiasm, age cannot

quell them, but they go on till death. To say that ability cannot be repressed or that this problem will take care of itself is a counsel of ignorance and ease. England and Germany both have new institutions designed to pick out gifted children in the schools and facilitate their advancement, regarding them as the most precious of all the national resources. For many years we have given vast attention to dullards, defectives and morons, and the question may well be asked whether universities also do not give too much consideration to the lower half of our academic groups.

V. Despite the great and rapidly multiplying institutions devoted solely to research, of which there is now a long list, where the investigator has no other duties and everything—books, apparatus, assistants—can be had by pressing a button, I see no ground for fear that these will ever interfere with investigation by universities. Perhaps a national university at Washington as a culmination of state and agricultural institutions, to prevent vast resources of the score of institutions from going to waste, to eliminate duplication of work between departments there, as President Dabney now urges doing for the national government something like that which the University of Wisconsin has done for that state, which would be a bureau of legislative reference and information, a clearing-house for students, federate societies, and, indeed, realize all the dreams about it, from Washington and Jefferson down to those of the late President Gilman when, in 1900, he undertook to preside over the Washington Academy and the memorial association, might be made to meet the needs of the situation. Despite all this there can be no real danger from any of these sources to university research. Colleges may compete for students and money, and there may be too many of them, but there is a sense in which there can be no competition but only rivalry in research. We have only just begun to know nature and man, and to draw upon their latent resources. Our descendants will look back upon our ignorance with the same *d'haut en bas* pity with which we do upon the attainments of our forbears. We cannot possibly have too many institutions or individuals engaged in research. In his recent little sketch of the history of learned academies, George Hale tells us that the great installation of learning which began with the enormous endowment of eight hundred talents, made by Alexander the Great to his teacher Aristotle, and which was the basis of the school at Alexandria, which lasted on till the fall of Constantinople, where, we are told, one thousand investigators were studying animals alone, and with its library of eight hundred thousand volumes, this, he

says, is still a model to be striven for to-day. So we are told in many respects were the great academies of the seventeenth century, many of them based on earlier secret organizations with their scores and sometimes hundreds of local branches, to which not a few of the early universities owed their origin. In his history of them Merz says in substance that not only able but often mediocre men, by the associations thus established, made important contributions to science. Surely there is no danger of too much research, and those who fear this now would have opposed the Renaissance in its day.

VI. Many, however, and finally, do think they see a real danger that investigation will be led captive by industry and that the distinctions between pure and applied science may be obliterated, and that research will get into dangerous proximity to the patent office. They point us to the corporation schools, in some respects the most significant movement of our day, the fourth volume, containing the proceedings of the fourth annual meeting having just appeared. They point, of course, to the Potsdam *Anstalt,* at the head of which was Helmholtz when he died, who was said to have gone over to the "*Technik,*" which offers the best equipment and the service of the best men to every industry. They point, of course, to the Ludwigshafen dye-works, with their four hundred buildings, five thousand workmen, and three hundred and fifty university trained chemists, to the Bell telephone research department, with a staff of five hundred and fifty engineers and other scientific graduates from over seventy institutions, and to a few dozen other great industries that are placing themselves more and more under scientific guidance, although in general this movement is little developed in this country. Robert Duncan, whose name has become almost a classic, since his death, in the European literature on this subject, and who devised the method of the Mellon Institute (which, as all know, takes on the study of industrial processes of any kind that science can help), makes the transfer to manufactures of a method which was well developed before here in agriculture. Such movements cannot possibly go too far. They are necessary, as England is realizing in its parliamentary reports, for national safety and preparedness. A nation that neglects them can never survive a long or serious modern war. We must admit that the line between pure and applied science is not quite as clear as it was. The severe strictures which Edison passes on academic physics and chemistry, and which Burbank is said to feel towards botanists, is factitious and can be only ephemeral. Marconi cherishes no such feeling towards Maxwell and Herz, who made his inventions possible. We

university men are fond of reminding ourselves that but for Langley the development of aviation by the Wright brothers and their successors would have been improbable, if not impossible. Jacobson tells us that the Teutons have succeeded for two years against the rest of Europe by utilizing the results of the researches of one man, Haver, on the fixation of atmospheric nitrogen, which enables them to obtain nitric acid in enormous quantities, that had this process been known outside Germany, the war would have ended by this time, and all countries would have been spared millions. Pasteur's researches which saved industries in silk, sheep-raising, the making of beer, wine, are another classic case. The history of indigo of which Germany two years ago exported twenty million dollars' worth to Asia alone, goes straight back to Liebig, Bayer, and to Kekulé's work on the arrangement of atoms. Optical glass, we are told, resulted from the scientific study of Abbe. Mr. Hetherstone has recently given us a little sketch of many such cases, and shows how often great discoveries are made by young students and sometimes even by chance. Daguerre had no more vision of the great value of his discovery than Faraday did when he showed his wife his first dynamo. The history of research shows that some of the best of it has had a purely humanistic motive, especially in medicine, and here we have a marvelous list of achievements impossible without special facilities for research.

But the highest and strongest motive that seems to have underlain much of the best research in all its brilliant chapters is the pure love of truth for its own sake. Many of the greatest discoveries have lain dormant for decades before they found any application, and to the latter their authors were often indifferent. There is something about the gratification of high intellectual curiosity which some people think knits the brain up into a closer unity than anything else. But to ask what happens, why and how, why does the top spin, roots grow down, animals breathe fast when they run, etc., to be able to order, harmonize, penetrate into the secrets of the world, to be ready if need be to " slay a beautiful hypothesis by an ugly fact," to feel oneself, in Fichte's language, the priest of truth and in her pay, ready to do and suffer all things for her, and especially to know by personal experience a little something of what the Eureka glow of discovery means,—this in itself constitutes the higher education of to-day. It is capable of generating the enthusiasm of young men to a degree which students of their nature ever since Plato have pointed out as their chief need. The great question of higher education is to satisfy this erethic need of young men. Calentures

they must and will have. The dull routine of lesson-learning and reciting kills it, but the spirit of exploration and inquiry precisely meets this need. Kepler, Cannon reminds us, after twenty years of study on a topic, says that only eighteen months ago did he get his first glimpse and at last he made his discovery, and this is the way he writes of it: "Nothing holds me. I will indulge my sacred fury. If you forgive me I rejoice; if you are angry I can bear it. The die is cast. The book is written, to be read either now or by posterity, I care not which. It may well wait a century for a reader, as God has waited six thousand years for an observer."

VII. Is not a vast and new responsibility now laid upon American universities, along with a call for a new independence of the past and of Europe, and must we not henceforth find or make our own way to a new leadership of Western civilization? I cannot fear the danger of Garyizing our universities, even though we have just learned that one institution has founded a Bureau of Salesmanship Research, with a fund of $75,000 provided by business concerns of its city. Too much of the life of the community cannot flow through our institutions. Research should and will be their vital breath, their native air. The instinct of research is too strong in human nature to be overwhelmed. In the middle ages persecution compelled it to elaborate secrecy, but hardly damped the ardor of its adepts, and so now neither commercialism nor academic drudgery can permanently check or divert it. In this pragmatic age utility has an inspiration of its own, and a long list of achievements to its credit. There is a large sense in which science is service and discovery a higher philanthropy, but there must be leisure which we forget is the very meaning of the word "school," and the great investigator must always cultivate a little monastic aloofness. Fichte said that the spirit of tireless research was the most sacred thing in the modern world, the most authentic voice of the Holy Ghost, that no one could speak of it without enthusiasm, and to disparage was to blaspheme. But I must end in a collapsing way by confessing inability to answer the question assigned upon the program. The problem can only be solved by the slowly evolving insights of the growing number of those who have a vision and so I conclude with the following rather paltry queries.

1. Can we not make efficiency in research the chief criterion of the admission of new institutions to this association? One applicant presents an impressive list of schools, departments, numbers, wealth and growth, but says nothing of this. Another large state institution, that has not applied but I am

told intends to do so, has just said through a committee that "an institution devoted to imparting knowledge without any effort to add thereto, no matter how varied and seemingly efficient its departments may be, does not deserve the name of a university," and proceeds to outline a definite policy of productive work, specifying that every university should have a group of notable creative scholars, that no man should be a full professor who has not given evidence of continued activity in scholarly researches since his original appointment, that teaching hours be reduced for all those qualified for or engaged in productive research, that if a man of high character and attainments be made professor it should be left to his own discretion to determine how many hours it is expedient for him to teach.

2. Should not each institution with a department of education add to the work that now includes only grammar and high school grades, one or more courses on the history of science, of learned academies, universities and colleges, their policy and the higher pedagogy generally. I know of only two attempts in the country ever made in this line. In one it was proposed but the president thought it might not harmonize with its administrative policies.

3. Can we not relieve young appointees fresh from the Doctorate from the monotonous and grinding drudgery of marking examination papers and excessive teaching?

4. A number of eminent professors in different institutions believe that there is a vast and as yet largely unexplored field for raising money, instead of for buildings and enlarging methods already operative, for researches of a specific nature, and as we all know, some recent donations for such purposes give hopeful indications in this direction.

5. Should not administrative officers have some special agency enabling them to keep in touch with the now many new schemes of developments in this field; for instance, the apparently simultaneous proposals this year from two sources for an institute of political and administrative research, on the plan of the Mellon Institute, for studying a long list of practical problems detailed in the two plans?

6. The National Research Council of the National Academy of Sciences, and the Committee of One Hundred, who have wisely begun their labors by attempting an inventory of all the various funds in the country available for research, and which planned both to coordinate it, clearing-house fashion, and also to stimulate it, not only for institutions but for private investigators, seem perhaps now the most hopeful agency to this end, under which we shall all want to cooperate and

in years this Council and Committee may be able to give some authoritative answer to the problem.

7. Finally, should not professors and departments, just in proportion as they have demonstrated their research power, be freed from administrative control, and be given complete independence? Some deans and presidents are successful investigators, but do not these functions tend to be mutually exclusive? Should not a man of this power be allowed to teach or not teach, examine or not examine, be present or absent, promote his advanced and promising students in whatever time and way he sees fit, and thus be a law to himself, and his department and its conduct be emancipated? This would of course produce great diversity, but is not this needed? In other words, can we ever have successful academic research till it is allowed complete autonomy, unhampered not only by officials but by general rules or faculty majorities?

EDUCATIONAL CONTROL OF THE PRE-SCHOOL PERIOD*

By William L. Dealey, Providence, R. I.

The slow development of public school control over the child should include as a further radical advance, advisory control of the pre-school period. An adequate conception of child growth implies this extension. Supervision of the prenatal period by agencies for conserving postnatal infant life, presents a ready parallel. The welfare of the child is "dependent in its origins upon ante-school conditions." From the medical standpoint, these conditions are not controlled because an unfilled gap lies between the infant-welfare centers of the first year and school medical inspection in the fifth. According to Forsyth, inspection points to widespread physical deterioration during these first five years, leaving the majority of children with serious but preventable defects. These defective entrants must be restored at high cost. As medical control is only a phase in the educational control of this period, this neglect represents inexcusable inefficiency on the part of school systems.

Physical Welfare

The first essential in medical pre-school control is to protect from contagion at any cost. The child's protection is so poor that Burnham[1] notes lymph alone is adequate; the epidermis is frail and unprotected; body cavities lack mucus with bacteriacidal properties and epithelial layers are less resistant; as a second defense the dermis and subcutaneous and submucous cellular tissue afford inferior protection. The blood is less resistant because less alkaline and with less bacteriacidal power (Weill): at birth but 28 per cent of the leucocytes apparently possess bacteriacidal power, at one year 40 per cent, at the third year 54 per cent (in adult life, 70 per cent). If its tissues are attacked, resistance is further lessened through the constant stress of growth. There result

* This study is a digest of related literature, such as the Tabular Statement of the federal Children's Bureau (E. R. Goodwin, 1916), or the Annual Proceedings of the American Association for the Study and Prevention of Infant Mortality (Baltimore). Facts are quoted to illustrate tendencies, not to present detail.

[1] *Cf.* Burnham, W. H.: The Hygiene of the Kindergarten Child. Proceedings of the National Education Association, 1904, pp. 416-22.

in the pre-school period from 1 to 5 years, roughly 88,400 deaths in the United States (1914). As the degree of protection increases with age, this mortality follows a rough curve of 52, 23, 14 and 11 per cent in its decline from 1 to 4 years. Child disease is admirably illustrated in measles, as after-effects may be serious and probably 80 per cent of the fatal cases are under 5 years.[2] Examining 5,538 entrants to the Chemnitz schools, Thiele found 64 per cent had undergone measles.[3] Burnham instances 1,077 fatal cases of measles in Munich among 28,988 cases, 21 per cent were fatal in the first year, 5 per cent from 2 to 5 years, and only .4 per cent from 6 to 10 years. Tuberculosis, as a further instance, in its inception is a disease of early life. Fisher has computed the preventability for diseases with the median age of death under 5 years; for example, diphtheria 70 per cent, diarrhea 60, broncho-pneumonia 50, whooping cough 40, or measles 40; for diseases with a median age at one year 47, and for other diseases of childhood 67 per cent. This excessive mortality is a rough index of the far larger numbers who become defective[4] during this pre-school period.

Periodic medical inspection is therefore essential to any control of the child and its pre-school environment (the home). To this end, the child's family should be coordinated with a unit of protective power stronger than itself, either a medical school inspection service or municipal division of child hygiene. School physicians, as in Cincinnati, may exercise a limited supervision by allowing children to bring their little brothers and sisters for examination. The extension of such supervision implies health centers in the schools. Illustrating control by child-hygiene divisions, Buffalo cooperates with the Babies Milk Dispensary Association, to follow the child till school age through infant-welfare consultations. The full development of such centers, as child-welfare stations, would supply an exceptional mechanism for monthly examina-

[2] For example, among 33,917 deaths at 1 year, 8% were of measles, 6% tuberculosis, 5% diphtheria and croup, 4% whooping cough, (29% general diseases); among 15,364 at 2 years, 12% diphtheria, 7% measles, nearly 7% tuberculosis (40% general); among 9,498 at 3 years, 46% general, chiefly diphtheria, 16%; among 6,915 at 4 years, diphtheria 19% (general, 49%). Deaths from diseases of the digestive system, startlingly high in infancy, at 1 year are still 29%, declining to 10% at 4 years. Of deaths at 1 year, 27% were through diseases of the respiratory system, decreasing to 15% at 4 years (1913).

[3] *Cf.* Burnham, W. H.: A Health Examination at School Entrance. *Ped. Sem.*, Vol. 21, 1914, pp. 219-41.

[4] *Cf.* the typical physical defects found in school medical inspections, for instance, adenoid growths resulting in arrest or defective teeth causing infections.

tions until school age. Although the majority of 71 organized consultations for well babies limit to 2 years, 9 receive until school-age and 8 place no limit. The Babies' Milk Fund Association of Louisville in its 6 infant-welfare stations provides weekly conferences with intensive home care till 3 years, and instructive supervision to 5 years, when children come under school nurses in the kindergartens. Conferences are provided from 2 to 6 years at 4 stations of the New York Diet Kitchen Association. The Chicago Woman's City Club (1914) also promotes fortnightly classes into which mothers with children 2-6 years of age are graduated. The Grand Rapids Clinic for Infant Feeding, for instance, places its age limit at 5 years; so does the Baby Milk Supply Association of Lexington (Ky.).

The remarkable present development of agencies for infant care and their inherent educational possibilities, are scarcely appreciated by schoolmen. The essential supervisory center during infancy is the welfare station which combines the milk depot with the infant consultation. At the consultation a trained physician or nurse systematically examines the infant before the mother, followed by home instruction under a visiting nurse. The station may distribute to mothers certified as unable to nurse, pure milk, either free or at prevailing prices, with instruction in home modification. Artificial feeding is thus discouraged. Goodwin found some 46 per cent do not dispense milk. Milk dealers should cooperate to provide instructive medical service for patrons.

As infant-welfare centers offer the mechanism for infant control, they are enjoying rapid development. Goodwin[5] reports 539 summer (397 winter) stations, supported by 205 agencies in 142 cities (1914). These stations utilize 714 full-time and more than 152 part-time nurses in summer (488 full-time and more than 116 part-time nurses in winter). Approximately 43 per cent, however, are concentrated in the 8 largest cities. One infant-welfare station for each city of 10,000, and for larger cities, 1 for each approximate 20,000, is suggested.

In an important group of cities efforts are still almost entirely private, city health authorities cooperating chiefly by control of the milk supply. The Baltimore Babies' Milk Fund Association illustrates the effective private agency. Weekly consultations in 16 welfare stations reach 7,059 infants. Cooperation is encouraged from registration of birth until 3 years. Fifteen trained nurses are employed (3 additional in summer) in home instruction. The mortality of these babies was only 6 per cent (for the city, 12 per cent); 14 additional stations are required. The Council Milk and Ice Fund distributes whole milk daily to some 400 families. The Association enjoys partial aid (15%) from the summer hospital for babies, Thomas Wilson Sanitarium; and shares in the Alliance of Charitable and Social Agencies. In a second related group of cities, cooperation with departments of health is somewhat more extensive. Thus the Washington authorities provide extensive publicity, while the Diet Kitchen Association cares for 1,749 infants through 5 attractive centers for mothers.

[5] Goodwin, E. R.: A Tabular Statement of Infant-Welfare Work. U. S. Children's Bureau, Publication No. 16, 1916. 114 p. This tabulation includes new and important data (1914).

In the more important present groupings, municipal departments include a large part of the infant-welfare machinery. After experimental demonstration by the New York Milk Committee the New York bureau of child hygiene now has 66 stations,[5] dispensing whole milk, but becoming permanent educational centers promoting hygiene on a large scale. It is aimed to create parental attitudes making it as natural to visit milk stations as to send older children to school. The stations reach 38,427 infants under 2 years. This municipal bureau cooperates with every private agency whose work it in any way touches. The New York Diet Kitchen Association for example, reaches 5,046 infants through 8 district health stations, and certified milk is distributed at the price of ordinary milk. The Nathan Straus Laboratories maintain in summer 17 (in winter 8), pasteurized milk stations. The 3 practical feeding stations of the Babies' Dairy prepare modified milk for sick infants, and each reaches 40-50 babies daily. In fine there are some 350 agencies in New York. The Babies' Welfare Association affiliates more than 90 members. This clearing-house offers perhaps the most complete cooperation effected in this line of work. Through its offices in the health department, it systematically places discharged maternity cases under the care of stations. A map of milk station districts and uniform records eliminate waste. By bringing important relief societies and stations together, with the social service exchange, free milk is provided without the former delays of investigation. Since nearly all the hospitals and settlement nurses are included, a time loss is avoided in placing sick babies. The result is an "organized campaign, planned on scientific lines and carried out with business-like efficiency."

The Boston system turns upon a remarkable private agency, the Milk and Baby Hygiene Association, in close cooperation with Boston's division of child hygiene, whose 13 nurses observe all births registered. In 4 Association health stations, conferences are held twice weekly, in 8, weekly. The staff includes 23 child specialists and 15 nurses trained in infant care and social work. The number of babies supervised has increased to 4,679. Seventy-four per cent are now wholly or partly breast-fed; and, according to Murray, the death-rate has been reduced 27 per cent. The co-operative Baby Welfare Committee, representing the chief agencies, studies the field to avoid duplication; milk stations are districted and correlated with hospitals.

Cleveland has developed an elaborate interlocking system. The municipal bureau of child hygiene is directly affiliated with the central Babies' Dispensary and Hospital, under the same medical director and superintendent of nurses. The bureau has divided Cleveland into 15 districts, each with a prophylactic dispensary supervised by a trained physician. These stations reach 4,478 infants, but some 40 would be needed completely to cover the city. Each dispensary is correlated with the central Babies' Hospital. The latter includes a milk laboratory, and finances the distribution of milk; sick infants are referred to its physicians. General, dispensary, tuberculosis and school nurses are represented in a Joint Committee of Public Health Nursing. The Cleveland Welfare Federation ensures support.

In addition to these important systems of great cities, among random agencies, the flexible Babies' Milk Fund of Detroit varies its educational and nursing work according to the need in districts of high mortality; as rapidly as the municipal division of infant welfare is in a position to cover any district, the work is advanced elsewhere. Each maintains 4 stations. The Children's Aid

[5] *Ibid.*

Association of Indianapolis has a successful solution of pure milk distribution. Milk is delivered directly into the homes by a large firm, after pasteurization from a selected tuberculin-tested herd. Its central clinic is within a few blocks of all car lines; 4 clinics operate the entire year, 4 additional in summer, and supervise 1,352 children under 5 years.[5] The municipal authorities meet half the expense. Among cities with less than 150,000, the Syracuse Infant Welfare Association through 8 school nurses from the Board of Education, conducts 3 stations in public schools of crowded districts, and hopes to turn an increasing share over to the bureau of health. Under the Dayton (O.) health department and Visiting Nurse Association, clinics for babies are open in school houses in four different sections of the city. Dallas (Tex.) has developed the first welfare stations in the Southwest, the Infants' Welfare and Milk Association supervising 2,602 infants. A monthly subsidy is paid by the city, and the Association federated under the admirable Dallas Department of Public Welfare. Illustrative of cities less than 50,000, health officers of the Oranges (N. J.) organized the Baby Welfare Association, and laid out 7 districts. This association is a centralizing agency, affiliating the 6 private associations which complete the system.

There is a further group of cities which rely essentially upon their health departments. Pittsburgh approaches such a system through the 20 summer and 7 winter stations under its bureau of child welfare.[5] Rochester's well-known system controls 3,691 infants in summer through the health bureau. This follow-up system includes 17 welfare nurses and 13 child-welfare stations located in public or parochial schools. The sale of milk has been discontinued. Supplies are furnished, unsanitary homes supervised and where necessary cleaned or screened.

Welfare stations may expand to deal with the entire family. Such a public health unit can focus all available agencies upon the families of a limited area. Milwaukee's first health center (1912) exercised for its district of 33 blocks, fairly complete postnatal supervision over every baby. The Philadelphia Child Federation maintains an experimental health center for the intensive study of infant mortality in one congested square, infant consultations (with 551 infants), further examinations of children 2-6 years, little mothers' leagues and boys' sanitary clubs, supervision of food products, and an intermediary rôle between neighborhood and city departments. Buffalo has 3 centers and would cover the city with such miniature health departments, following the lines of C. O. S. districts. The National Social Unit Organization (New York) now plans the intensive survey of limited experimental areas, for instance, in Cincinnati.

Classification of infant-welfare systems reveals the increasing share of municipal health departments. In 60 cities, 181 stations were operated by municipalities alone; municipal nurses instructed parents in 100 cities.[5] The expense of conducting milk depots on a large scale is beyond private philanthropy. Divisions of child hygiene in 20 departments of health have given a remarkable impetus to systematic effort, and by cooperation with medical charities such divisions should control physical child welfare.

To this end, expansion is urgently needed. The New York Milk Committee was unable to secure reports of the previous year's infant mortality from 43 per cent of the 252 larger cities. Only 4 health officers could vouch for a rate below 50 per 1,000 births. Goodwin found 24 per cent among 555 city health officers did no

[5] *Ibid.*

infant-welfare work, and 46 per cent felt limited to milk inspection. Similarly, Schneider's (1913) questionnaire from health departments in 201 cities, showed 22 per cent making no effort for infant welfare; 33 per cent of the smaller cities had no such plans, but 69 per cent of cities 100,000-300,000, and 94 per cent of larger cities had the essential features of a complete system. A most important cause for this neglect Schneider found in the low average of 33 cents per capita for health department appropriations.

Where the population is scattered, elective boards of public welfare or local health associations in counties or groups of counties might administer the work of state health departments. Kansas, New Jersey, New York and Ohio have specific divisions of child hygiene. Statewide organization is also supplied by private agencies. A department of the Wisconsin Anti-Tuberculosis Association, for instance, has concentrated on the infant mortality of the state; or the Ohio Public Health Federation, or Illinois Public Health and Welfare Association, are organized for one working state unit. Of national institutions, the federal Children's Bureau and the American Association for the Prevention of Infant Mortality (with 135 affiliated organizations), are among the foremost unifying forces in the infant-welfare field. To avoid the confusing educational effect of diverse campaigns upon the public and other overlapping, present national systems should affiliate in a strong public health league. The general American Public Health Association, American Medical Association, or the American School Hygiene Association, now emphasize child hygiene. The Committee of One Hundred on National Health (New York) hopes to unite all government health agencies in a National Department of Health.

The effectiveness of mechanisms such as infant-welfare or health centers largely depends upon personal instruction of mothers by visiting nurses. Simple, flexible systems of visiting nurses supplement the resident nurse among families of moderate means,[6] and extend free, skilled care to the poor in their homes. In Providence, for example, the Visiting Nurse Association supervises children until replaced by school nurses at 4.5 years. Though reaching a limited number, such nurses are the most far-reaching preventive force in public health.[7] The extension of their instructive supervision should be rapid, and if possible reenforced by state staffs of public health nurses.

According to Waters (1915) some 5,152 public health nurses are employed by 2,066 different agencies in district nursing, representing a country-wide network. Goodwin reports 198 cities with home instruction in infant hygiene by 466 full-time and 460 part-time summer nurses. Of the full-time nurses, 80 per cent are municipal; but

[6] Wrigley finds 108 "hourly" nurses, for such families.

[7] Neff (1911) reports in 4 congested Philadelphia wards, 8 trained nurses reduced the infant death-rate 27.3% (all wards only 11.8%). Baker contrasts the continuous supervision of home visits by nurses (60 cents per month) with the cost (2 dollars) and mortality (2.5%) for milk depot care alone (but 1.4% of 16,987 infants under nursing care died).

returns for part-time nurses are admittedly small, since the incidental work of a majority of the visiting nurse associations is involved. Waters' statistics which include 98 nursing centers under departments of health and 22 under departments of education also indicate the trend toward municipal nurses.

In the American Nurses' Association, three great nursing organizations meet, broadly co-ordinating all nursing systems. The American Nurses' Association is composed of 238 alumnae associations, 51 city or county and 45 state organizations. Through the efforts of these state associations, laws and curricula are drawn, training schools accredited and educational standards maintained. This state mechanism includes an examining board. The National League of Nursing Education contains about 500 active members, though representing less than half the total number of training schools. The National Organization for Public Health Nursing met for the first time, 1913.

Their first essential is a school problem, the training of nurses.[8] This important group of vocational schools, as an integral part of hospitals, clearly suffers by its isolation from other educational systems. There are 1,250 training schools in the United States, with 36,120 pupils, a total capacity of 124,139 beds and a daily average of 80,078 patients (1914). The first striking fact is the persistence of low standards for admission. Nutting (1912) found 692 schools with all degrees from a vague "high-school" requirement (35%) to common-school preparation (28%). A longer probation in practical procedures is therefore necessary, possibly of 6 months, before entering the wards. Unfortunately, shorter hours have not generally followed the tendency to require 3-year courses. Nutting still found 45 per cent with 10 or more hours duty. Employees should release students from uneducative repetition in routine domestic service. Where possible, hospitals should maintain a salaried body of staff nurses, to increase the ratio of graduate nurses. At present for a minimum of instruction, student-nurses perform a maximum of service for the hospital. Not only classrooms or small libraries, but systematic instruction is often lacking. Nutting found 315 schools without paid instructors. Of 328 schools registered under the New York State Regents, 81 per cent have no resident instructor in dietetics. In remedy, such schools should either be adequately endowed, receive state or municipal aid, or cooperate with medical schools.

Increased teaching material is essential. The capacity of 692 hospitals, Nutting found to range from 5 to 500 beds. About 60 per cent average under 75 patients, about 25 per cent not more than 25; yet the minimum of the New York Regents is a daily average of 30 patients. La Forge mentions 22 hospitals with 1-3 months practical work in children's wards, and 3 with 6 months, but the average general hospital cannot afford such experiences. Such hospitals should employ affiliation with other training schools to consolidate the training system. Some 35 per cent of the hospitals, according to Nutting, also send their pupils into families for nursing experiences of 2-26 weeks.

The public health nurse should supplement such training by post-graduate specialization. Lacking scholarships (such as the Robb Memorial fund), the solution may lie in an adaptation of part-time or continuation schooling. Among post-graduate courses, 3-months' work in the New York Nursery and Child's Hospital includes the

[8] A minor school problem is the training of nursery maids, in babies' hospitals, or even in day nurseries.

children's wards, observation ward, babies' clinics, the "boarding-out" system, or optional work in the diet kitchen. Home visiting which will lift families to a normal level also implies special training. To instruct the mother in feeding her children, for instance, requires training in economical dietaries.[9] For such preventive social nursing, the post-graduate course at Teachers' College (Columbia) is an important development. This school employs active field work with district nurses and the health bureau. Similar cooperation between post-graduate schools and well-established visiting nurse groups exists in Philadelphia, Cleveland, or Boston; the Universities of Cincinnati and Ohio State also offer courses in public health nursing. A supplementary trend is affiliation with schools of philanthropy.

As these trends show that the training of nurses is about as poorly provided for as that of teachers, state registration should be an essential for pre-school work. Training standards and registration after examination are established by statute in 35 states (1915). Four-fifths are permissive, but 6 states believe they register more by compulsion. The future of reciprocity between state boards hinges on the standards of training schools. A national examining board for nurses should aid such standardization.

Generalized nursing is illustrated in Dayton (O.), where all nursing interests are pooled. Each nurse is a sanitary inspector, and cares for every case in her district. One nurse in a small district for all public health work is held to increase family confidence, prevent duplication and approach health problems as a unit. Lacheur found 100 nursing associations in smaller cities agreeing that the combination of infant-welfare work with general nursing was possible. Goodwin lists over 100 examples of part-time infant nursing in towns of less than 10,000. It is difficult to secure specialized nursing in small towns, and in rural sections almost impossible. The rural nurse of necessity may combine the functions of infant-welfare, tuberculosis and obstetrical nurse, sanitary inspector, school nurse, even charity visitor, probation officer or playground worker. Rarely is there specially organized infant-welfare work in rural sections. The cooperation of the rural school teacher, however, affords a direct approach to the mother's interest. Health supervision of factors such as sewerage, water, milk or other food supplies, is left to individual control. Mechanisms such as hospitals, clinics or district nurses are unusual. The Red Cross Town and Country Nursing Service has some 70 rural nurses in the field. The Visiting Nurse Association of Baltimore, for instance, has nurses in the counties of Maryland. The District Nursing Association of Northern Westchester County (N. Y.), with headquarters at Bedford, has divided its territory into 7 districts, each with a part-time infant nurse.

Generalized nursing, however, lacks the efficiency which comes from modern specialization. The family may still be considered as a unit by bringing together, preferably within the public school, all agencies at work in a district. Gerstenberger (1915) found that at least in Cleveland, among the families of 818 babies coming to the stations, from 87-95 per cent had been visited by but 1 organization in a given month, and among 500 families coming to the Central Dispensary, 79-89 per cent; while less than 1 per cent of the families received more than 10 visits. Similarly, in Chicago, according to Phelan, with

[9] In a complete system the visiting nurse is aided by partly trained, inexpensive attendants; and her work supplemented by highly trained visiting dietitians, visiting housekeepers, visiting teachers, social workers and women rent collectors.

specialized nursing groups in 597 families, only 25 were visited by 2 nurses, and the question of duplication reduces to cooperation.

School nurses frequently assume infant-welfare functions. Under the Pittsburgh bureau of child welfare, they work the year round following infants from birth up into the schools. In New York, 200 municipal school nurses contribute largely to infant welfare, instructing little mothers' leagues, visiting in the homes and referring to milk stations. Chicago with 93, Detroit 15, Indianapolis 10, and among lesser cities New Haven with 7, further illustrate full-time summer use of school nurses. Among cities of less than 75,000, Jacksonville (Fla.), Kingston (N. Y.), Oshkosh (Wis.), or Dubuque (Ia.), employ the school nurse for part-time infant work through the year.

The intimate relation of visiting nurse service with dispensaries and hospitals, is most clearly revealed in modern hospital social service. Some social service departments maintain infant-welfare stations. In New York, for instance, centers of departments at Lebanon Hospital, Bellevue and Allied Hospitals, and the Mt. Sinai Hospital supervise more than a thousand infants. The social service department extends preventive activity in the homes. Thus the Babies' Hospital of Philadelphia affords follow-up care until 6 years for every child discharged. Their plan includes a card record showing physical condition from the period under care to school entrance, and the first physical examination under the board of education. The hospital is now following 900 cases, building the foundation for a large educational work.

In the brief period from 1905-13, according to Cannon, over 100 social service departments developed. This department is an integral part of the hospital process, and so preferably under hospital control. An important aid is an advisory committee, as at the Massachusetts General, or St. Louis and Chicago Children's Hospitals. A social diagnosis and attention to the social complications of the child's disease are intimately connected with medical diagnosis and treatment. The Milwaukee Infants' Hospital, for instance, investigates and corrects home conditions while the baby is at the hospital. Nurses of the unique Boston Floating Hospital investigate the home conditions of every child and instruct the mother in the home.

Some of the most successful social service is connected with dispensaries. Under the follow-up system of the Philadelphia Babies' Hospital, the mortality of babies discharged decreased from 22 to only 3 per cent. At the Boston Dispensary, children discharged are referred to the outpatient service equipped with a visible-file index, follow-up postals and home visitors. Among 245 discharged infants (1914) 25 per cent were well, 50 per cent improved and 9 per cent not improved; at the end of 3 months, 23 per cent were well and 42 improved; in 12 months, though living mostly in poor homes, 49 per cent were well, and 18, improved. The average result was a steady improvement, though 76 per cent of the cases involved educational problems in the home, and 89 per cent, family problems, such as illness, acute poverty or illegitimacy. Without such supervision the hospital resources would have wasted in readmittances through failure to convalesce properly, reinfection or intercurrent disease.

The dispensary is also an important part of the unified hospital process. It should become a center to which sick infants are referred from surrounding prophylactic milk stations. As random examples of children's dispensaries are, the Babies' Hospital and Children's Hospital departments in Boston; or in New York, of the Babies' Hospital, the Nursery and Child's Hospital and the Wilkes Dispensary of St. Mary's Free Hospital; in Philadelphia, dispensaries of the Children's Homeopathic Hospital, the Children's Hospital and St. Christopher's Hospital; or of the Washington Children's Hospital. Its general possibilities are suggested in a growth from 200 (1904) to at least 2,300, according to Davis (Boston Dispensary). His estimate, however, includes every form of clinic as well as about 1,000 treating general disease among the sick poor.

The infant ward or hospital, when correlated with the consultation for well babies, is an integral part of the pre-school system. For observation of the more serious diseases, accurate diagnosis, and the proper care of very sick infants, the hospital is essential. Many general hospitals handle children, but fail to appreciate their institutional requirements. The construction, equipment, organization and operation of a hospital for young children, as Holt points out, are quite different than in a hospital for adults. Infant feeding requires special equipment and specially trained service. The wards are smaller and with ampler provision for separation, young children are so susceptible to infections. Outdoor summer wards are used, such as the hospital camp of the Associated Charities, Washington, or the baby hospital, Memphis. The general possibilities of hospital control lie in 6,745 institutions caring for the sick (1914). Unfortunately there are no accepted standards of hospital efficiency. Gilbreth finds the usual conditions much worse from a managerial standpoint than in the average factory, and in some hospitals so bad as to warrant closing.

Where medical supervision operating through school or infant centers, visiting nurse systems or the social service of hospitals and dispensaries, is insufficient for the full control of early physical development, special consultations under either school or health authorities, should specialize in children of pre-school age.

A further device to control physical neglect among the infants of working women in cities, is the day nursery. The United States has enjoyed its rapid extension until 618 nurseries, according to Dodge,[10] now have an aggregate daily attendance of about 30,000 (1914). The total number, however, is insignificant when compared with the need. Where the mother is necessarily absent at work, the nursery supplies immediate relief by supporting the child during the day. Such aid should be based upon investigation. As Dolbeare suggests, intimate daily contact with the child affords opportunity for a social diagnosis of both child and family. On this diagnosis proper relief agencies may be utilized, the nursery becoming a clearing-house for preventive work. The

[10] *Cf.* (Biennial) Proceedings of the National Federation of Day Nurseries (New York).

Helen Day Nursery (Chicago), for example, through its bureau of personal service investigates cases, and by housekeeping funds is enabled to clean up dirty homes. At the Fitch Creche (Buffalo) the kindergartner as a social worker visits all mothers; 2 New Bedford nurseries unite to employ a trained investigator for written statements regarding each applicant. Where loss of the father has broken the home, mother's pensions in some thirty states should enable the poorer mother to maintain her child. The spread of modern social insurance may prove even more adequate. As a makeshift for family care, most nurseries now admit an increasing number of children with both parents working. Some form of cooperative public nursery should extend to middle-class mothers. Gallichan suggests community nurseries as part of a program of state aid for motherhood.

The large cities are already forming systems of day nurseries, correlated by an association. In Greater New York alone, ninety-four nurseries with an aggregate daily attendance of 5,528, affiliate to form the Association of Day Nurseries; the Association of Catholic Day Nurseries includes fifteen. The Chicago Day Nursery Association comprises thirty nurseries (with 4,432 children) and makes fortnightly inspections. The Boston Conference is composed of twenty-seven day nurseries (nine in Boston). The Newark Association is standardizing the work of six nurseries, with municipal aid. The Sheltering Arms Association of Day Nurseries in Atlanta coordinates five nurseries.

The day nursery receives comparatively few infants under six months. Since its care centers upon children under six years, it supplies an essential gap in the supervision of children over one year in age. The best nurseries provide medical examination on admission, owing to the danger of epidemics. Among the twenty-three associated Philadelphia nurseries, eighteen record physical examinations and thirteen, the family health history.[11] According to Kerr, of 178 New York children, 114 were found to have physical defects and 109 were treated. To insure continuous medical supervision, nurseries should submit to the rules of the health department, as in New York with monthly visits by the medical inspector. In France all public nurseries must be controlled by a physician, under government inspection. A trained nurse should be connected with the staff of public nurseries. In Cleveland,

[11] A related agency for children from tuberculous families is the preventorium. Thus the fresh-air camp at Farmingdale (N. J.) boards New York children (4 years old) several months, during which municipal nurses make home conditions safe.

for instance, a regular daily inspection is made by the Day Nursery and Free Kindergarten Association. This problem is related to the control of kindergartens by school nurses.

Educational Control

These mechanisms for the medical supervision of this period, such as extended infant consultations, visiting-nurse systems, hospital social service, or even the day nursery, derive their peculiar importance from the extent to which they become educative devices demonstrating to parents proper child care. Control of the pre-school period is an educational, not a medical, problem. Its development is tending toward an immense educational system, as yet unrelated, for parental training in infant care. Its educative devices in their lack of academic formulae and their realization of learning through participation in live and essential situations, exemplify future school activities. Such a movement not only embraces the public school, but is a virtual continuation of it. The important step is to extend its influence over the entire pre-school period. The need reveals itself in the commonplace wastes of child health and ability. Schwarz (1910) rating 670 mothers as to their knowledge of infant hygiene, ranked seventy-three per cent as unsatisfactory. The New York A. I. C. P. (1906) found sixty-five in 108 mothers never heard of the curative value of fresh air, seventy-nine, how to feed babies, ninety-five, proper child-clothing. The Children's Bureau at Johnstown found a mortality of 148 per 1000 births among the infants of 445 literate mothers, but a suggestive increase to 214 deaths among the infants of 246 illiterates. These are random suggestions of the large amount of public teaching necessary before control of the pre-school period can be carried out in practice.

Such teaching commences with organized publicity methods and culminates in the public school. Publicity implies as many different means in as many different channels as possible, but concentrated on certain important points, at appropriate times. Personal demonstration and visitation through trained nurses and physicians are simply the most valuable among many methods. A first essential is to educate editors and publishers. The potential services of the newspaper are commonly undervalued, but at least nine state health departments have a weekly press service of non-technical articles. New York's news bureau adds health hints mailed ready to place in forms. The North Carolina service, for instance, has Save the Baby articles; the Kansas division of child hygiene, a weekly press letter, while general articles reach

about 500 newspapers; the Illinois bi-weekly health stories find practically every paper in the state. Among university extension departments, Wisconsin prints in 330 papers, and Texas employs a trained newspaper writer. Various important national journals now include as valuable from an advertising standpoint, baby-saving campaigns or columns of advice to mothers. Thus the Woman's Home Companion has developed a "Better Babies" service, or the Ladies Home Journal and Delineator publish expert columns.

Literally tons of educational leaflets have been distributed and are readily controlled. Goodwin found at least 400 infant-welfare centers presenting literature to mothers. Even the organization reports may eliminate useless material, break up their headlines, and become educational. A related device is the reporting of health surveys. Typical pamphlets are the North Carolina bulletin, The Baby, the New York State division's How to Save the Babies, or the recent publication by the federal Children's Bureau, Infant Care. Goodwin lists twenty-six state departments of health distributing such literature. Twenty have systematized this educational device in a monthly bulletin service on general health; fifteen issue quarterly bulletins. Michigan issues a special number on infant welfare, with cartoons; and five states add special child hygiene numbers. Among University extensions, the Oregon Agricultural College utilizes the Grange to place articles with mothers; Wisconsin has bulletins on infant feeding or hygiene; and the University of Texas, thirty health bulletins. Among large-scale private agencies, the Metropolitan Life issues related pamphlets. In order to reach foreign mothers, both state and city departments have printed polyglot leaflets. An informational circular should reach all mothers officially registering births; the Washington (D. C.) health department, for instance, cooperates with the public library in sending such literature. A more personal touch may be added by circular letters at registration, as by Indiana or Louisiana; North Carolina has sent letters signed by the governor. A business-like circular letter may be supplemented by the telephone.

Distribution of literature is an effective adjunct of the public address and entertainment. Health departments of thirty-two states, according to Goodwin, report lecturers supplied for talks including infant hygiene; Wisconsin, five deputy health officers; Indiana, a lecture staff of four; and New York's division of publicity and education, three lecturers. In Mississippi, county health officers lecture in the schools on infant welfare. Important lecture systems have appeared in extension divisions. Of sixty-three state univer-

sities, Goodwin found twenty-four with educational lectures. Ohio State University (Columbus) develops infant welfare in connection with one-week movable schools; Texas' division of home welfare gives infant-welfare talks at county fairs, or in connection with a one-week school, county rally, or home-improvement car; the University of Wisconsin, in community institutes. This extension is frequently associated with the home economics departments of agricultural colleges.

Visual presentation in motion pictures is rapidly becoming an important educational aid, since it popularizes the message in concrete form. At least fourteen state health departments use educational films on infant hygiene. Thus Illinois presents Tommy's Birth Certificate; New York, the Care of Babies and Improvement of the Milk Supply; Indiana has six films. The University extensions of Kansas, Texas and Wisconsin also show moving pictures. The Chicago board of health (1911) presented educational films at weekly mothers' conferences, one film illustrating in detail the work of the department nurse. The department has since developed a series of motion-picture dramas.[12] A typical film, The Fight for Babies' Lives, was shown in twenty Cleveland theaters, the expense being levied on its members by the Motion Picture Exhibitor's League. Slides may supplement the films. These have been developed by the United States Public Health Service, and by twenty-eight state health departments; Indiana for instance, has 800, Ohio 1500. Stereopticon slides are also furnished by the Universities of Kansas, Texas, or Wisconsin (with 1000). In Baltimore, cut-out health slides are shown in the picture theatres.[13]

Modern educational exhibits combine films, slides, photographs, wall panels, mechanical and still models, or other devices. The health exhibit of the children's bureau at San Francisco utilized colored transparencies and electric contrivances, colored relief maps, screens with new color-schemes, and living exhibits. Pennsylvania illustrates a remarkable series of baby-saving shows, the state department aiding local communities. Exhibits of the parent Philadelphia Baby-Saving Show (1912) included panels and models, demonstration of baby care, and outlines of the work of children's agencies. To newspaper space and street banners, educational motion pictures and popular lectures, was added a two-day conference on infant mortality. One of their best baby-saving shows was held in Erie (1915). Twenty-five states, according to Goodwin, have these special educative devices. The traveling exhibits of some ten departments devote special sections;

[12] *Cf.* dramatic plays, as the Theft of Thistledown (Pittsburgh).
[13] *Cf.* posters (electric signs, billboards, window cards, streamers).

Illinois' infant-welfare sections, for instance, are booked for months in advance; Iowa's child hygiene exhibit shows at state and county fairs. New York has three traveling units, with twenty panels and a model infant consultation, each under a manager, trained nurse and mechanician. At least six states have general health cars. Thus infant hygiene is a special feature of the Texas public health car, and Louisiana's educational train devotes more than one-sixth its space. Traveling exhibits are also a product of six important University extensions. Such exhibits are admirably adapted to village and rural communities. For cities, the publicity methods of the New York Child Welfare Committee (1911), with its local surveys and organization of exhibits, are significant. Within three years this remarkable child-welfare exhibit has broadened into important exhibits in fifteen cities. The National Child Welfare Exhibition Committee plans to exhibit constructive state programs; and the Russell Sage Foundation includes a department of surveys and exhibits.[14]

Educational efforts in preventive infant welfare may well culminate in Baby Week or similar campaigns pooling different publicity devices. More than 2,083 Baby Week celebrations were definitely reported to the Children's Bureau (1916). This movement formally sets aside a period in which to popularize civic and family responsibility for better babies. It may involve local cooperation with the federal children's bureau and General Federation of Women's Clubs; and tends to become state-wide.

To these educational devices should be added the better babies' contest, a highly specialized development of the infant consultation along publicity lines. Promoted at the Louisiana State Fair (1908) and two years later in Iowa, contests were held at twenty-five state fairs (1913). According to Benton, seventy-one state and about 1,000 county and local better babies' contests have been given (since March, 1914). Important contests include Colorado, Idaho, Mississippi or Oklahoma State Fairs, the Illinois Farmers' Institute (Decatur) or the McLean County Child Welfare Association (Bloomington). The University of Texas not only supervises at the Texas State Fair but organizes contests for county fairs; and five other University extensions actively promote these contents.

The better babies' contest involves a significant blending of the practical and theoretical. Its systematic observation of best specimens should demonstrate what normal infancy is. Its actual scoring of each infant discovers unnecessary defects early in life, when adequate remedies are possible. This element is increasingly realized by extending the entry limit to

[14] Also exhibit material by the Children's Bureau, Amer. Assn. for the Prev. of Inf. Mort. and Red Cross Nursing Service.

five years in order to supervise the entire pre-school period, and by ranking the infant not on actual condition but according to improvement within a fixed period. In Philadelphia, a Child Federation contest judged 600 entries on physical improvement in the baby, plus the sanitary improvement of its home, during four weeks. Pittsburgh's baby week initiated a baby improvement contest with prizes awarded in six months. At the Texas State Fair, the staff of physicians and nurses made thorough examinations of infants ranging from six months to five years, and a prize award to the baby with the highest improvement over its score the previous year.

From the eugenic standpoint, these contests represent an awakening of the parental conscience (*Einstellung*). Through a continuous propaganda for thorough examinations at intervals, they teach parents to see the importance of registering defects with care. The emphasis is properly placed upon the parent in the "better mothers' contests" reaching 540 mothers under Buffalo's health department (1914), or the prize mothers' contest of the Interstate Fair at Trenton (1915). This educational effect should be heightened by additional publicity methods which develop the newly aroused parental interest. Publicity which the awarding of prizes invariably attracts from the press may be accentuated by social features.

The technique requires a thorough examination by responsible physicians, assisted by trained nurses. A preliminary examination and other precautions should be taken against infection; preliminary contests and a special appointment for each mother, should avoid over-crowding and strain. The Texas State Fair, for instance, permits only mothers in the examining rooms; the West Michigan State Fair handles entries in rooms protected by glass from the public. By reducing the "exhibition" of babies to the minimum, the abuse of unsystematic contests is avoided.

The central factor in these contests is obviously the score-card, characterized by G. Stanley Hall as the "crux" of the movement. It should embody a "list of apperception centers from which the people should be encouraged to think, talk, read." Unfortunately in the usual score-card, the tests have been wide of essentials. The card of the Iowa Association, for instance, offered as mental tests six curious generalities, "facial and ocular expression, intelligence, tractability, attention, imitation, disposition," counting for arbitrary points. A score-card of the Better Babies bureau[15] was a real advance, substituting definite psychological tests for different age levels, derived from the Binet-Simon scale. By similar tests of sev-

[15] *The Woman's Home Companion* (New York). *Cf.* the American Medical Association standard score-card.

eral thousand infants, proper norms for respective mental ages might be developed.

In place of the usual catalog of various anatomical parts, the Better Babies bureau added a physical examination for defects which heavily influences the awards; while a series of definite measurements, though based upon an explanatory wall-chart, count for relatively little in the awards. With norms based on physiological age, the scorer is concerned with imperfections which significantly affect the child's efficiency. Numerous measurements may warrant classification in percentile groups, such as have been worked out by the department of child study in the Chicago schools. To plot them graphically would allow the definite placing of the infant in all possible comparisons with his group. Where definite standards, rather than ratios, are presented, they probably fail to cover even normal racial variations. With advancing data, norms might be roughly classified as at Ellis Island, into perhaps seven racial groups, developing standards for each group and a provisional point scale.

The score-card of the Better Babies bureau offered an interesting infantile history, including food and sleep. Brief data as to crying, fears, or diseases such as syphilis or tuberculosis, might be added. An antecedent personal history for each child would be of eugenic value, if safeguarded to ensure accuracy. It should roughly cover the ancestry and salient family traits, whether of defects, diseases, talents, tastes or peculiarities, physical or mental, of both parents and grandparents. A simplified form derived from the lengthy blanks of the Eugenics Record Office, reenforced by a brief family chart (genealogical), should develop a healthy understanding of the child's inherent possibilities.

The present tendency, however, is probably toward the more moderate conference, rather than contests. As a special flexible outgrowth of infant-welfare centers, the children's health conference developed at the National Conservation Exposition, Knoxville.[16] The conference room was enclosed in glass so that the public might observe, but not intrude. Treatment was not given, nor were the babies scored, but defects were pointed out and advice freely given. By eliminating the contest, it was hoped to attract the "rank and file" of babies, including the mothers of potential "losers." Nearly 1,000 babies were examined. In the exhibit by the children's bureau at the San Francisco Exposition, a model baby clinic was daily held behind glass walls. Circuit conferences with simple exhibits are effective units of public health instruction.

[16] *Cf.* conferences at Toledo, Atlanta, Peoria; Jacksonville; or the parents' educational bureau (Oregon Congress of Mothers).

So essential is the educational guidance of mothers, it would be surprising had no agencies specialized in organized training. Schools for mothers, schools of domestic arts, and special continuation classes, are important mechanisms in meeting this need. The English Association of Infant Consultations and Schools for Mothers[17] includes 200 centers among the higher and upper-middle working classes. Many have classes for mothers with teachers supplied by local education authorities. The grants of the Board of Education for England and Wales (1916) include $76,000 for day nurseries and schools for mothers. The St. Pancras (London) School (modeled after the Ghent School) for example, combines with the varied practical activities of an infant consultation, lectures and various classes for mothers, a club to awaken the interest of older girls, and a fathers' department meeting weekly. In the United States, milk-station instruction is effective because the aim is focussed definitely upon an individual baby. Modern methods of learning realized through doing replace mere information (which seldom leads to action). Goodwin lists some 250 infant-welfare stations having such practical classes or clubs for mothers.[18] Settlements may develop classes, as at South End House (Boston) which has a senior babies' club supervising from 1.5 years to the kindergarten age, or at Starr Center (Philadelphia). Day nurseries form such classes as they assume settlement activities. To the Mary Crane Day Nursery (Chicago) are referred ignorant mothers needing physical care or assistance. Such mothers are given certain work at the Nursery (for a dollar and care of their children) and are so rotated as to receive a thorough training in domestic work, even utilizing the sewing room to make clothing for themselves and children, and the kindergarten for recreation in games, music or dancing. The Newark Association in its six nurseries or the Delaine Street Nursery (Providence) also illustrate this wider use of the nursery building. As a reverse of this tendency, roughly twenty per cent of over 400 settlements have day nurseries and forty per cent kindergartens.

Classes may become specialized schools for mothers. Caroline Rest, a convalescent home and school at Hartsdale (N. Y.), entertains 1,901 guests (1915). Mothers with infants learn by sharing in the daily practical routine over a period of 2-3 weeks. This school controlled by the New York A. I. C. P.

[17] As a department of the National League for Physical Education and Improvement (Ashby, 1915).

[18] For instance, stations under divisions of child hygiene in New York, Philadelphia, Cleveland, Pittsburgh, Buffalo or Milwaukee.

(whose bureau of relief includes some 3,000 infants in its families), has now received a bequest of approximately 3.5 million dollars. In Detroit nearly a million dollars has been left to found a mothercraft school for older girls. A school of Mothercraft (New York) was initiated by (Miss) Read (1911), later with a local and now a national, auxiliary. This type of school would receive in a private residence, resident students, day classes, and a small group of resident children of varying ages. The pupils learn by actual work as part-time assistants to these children.

Pre-school care, however, is an inseparable phase of a much larger field, so that its most vigorous future, educationally, lies in modern vocational schools and departments of domestic arts. The vocational course affords a framework for including instruction in pre-school care. The Stout Institute (Menominee Wis.), the Garland School (Boston) or Teachers' College (New York) illustrate specialized schools. Home economics courses were offered in thirty-one state universities, 230 summer schools, 160 state normals, and recognized in all agricultural colleges admitting women (1915). As an integral part of the general educational system, public continuation classes for mothers should be incorporated into the schools. A successful Rochester experiment provided a day course of twelve health lessons for women at the East High School; a trained nurse and woman physician taught the care of children and the sick. Parent-teacher associations and clubs for the instruction of mothers should be applied even in consolidated rural schools. University extension courses[19] reach thousands of married women; other extensions distribute outlines on infant care for mothers' circles.[20] The University of Wisconsin provides instruction by correspondence in a home economics course including prenatal care, the lying-in period, infant care and growth. Correspondence teaching by the American School of Home Economics (Chicago) has reached perhaps 20,000 persons. By formal conferences, the American Home Economics Association seeks to stimulate progress.

Systematic preparation for parenthood should also include in the public continuation school system, all girls leaving school at fourteen. This is the strategic period for building home interests. Intimate contact with small children in the study of their pre-school management should automatically and

[19] As in the Universities of Wisconsin, Kansas, Missouri or Minnesota.

[20] For instance, the Universities of Nebraska, North Carolina, West Virginia, or Texas.

wisely direct adolescent tendencies. In proportion as correct attitudes are developed, the adolescent girl will exercise a proper influence for pre-school control. Cincinnati's system offers the most familiar standard for continuation classes. In Massachusetts, child nurture is recognized by state-aided schools, for girls fourteen to seventeen years in day school, working girls seventeen to twenty-five in evening classes. Snedden suggests specialized part-time schools, with perhaps three to four hours in systematic home projects. These schools should develop well-organized correlation with hospitals, day nurseries or infant-welfare centers. To the practice house[21] now recognized as essential in school equipment, might be added day nursery activities. The Y. W. C. A. and settlement may contribute continuation classes. Hiram House (Cleveland), for instance, has a model cottage to teach young girls, at school or working, the elements of intelligent home-making.

Continuation classes supplement or substitute for the high school and the two institutions together offer the special mechanism for reaching the largest numbers. Thirty-three states authorize home economics in secondary schools; and 2,440 high schools (21%) report such courses (1914). Pre-vocational experiences in the changing junior high-school period afford a particularly happy opportunity for pre-school guidance. Mangold suggests domestic arts be made compulsory for all girls in the seventh and eighth grades. The New Haven board of education is experimenting with instruction in the care of young children to eighth grade girls by the school nurse. Philadelphia is equipping school house-keeping centers to instruct the seventh and eighth grades in baby care. Los Angeles has four day nurseries in its public schools; and under the Gary system, at Froebel School, a day nursery affords the older girls practical supervised experiences in the care of children. Other important educative devices are the organization of Camp Fire Girls, and school credit for home projects. Returns from 232 representative high schools indicate in 23 per cent some form of home cooperation. Camp Fire members number approximately 64,000 (1914). As emphasized by Gulick, Camp Fire groups study the infant problem, and to become "Fire-Makers" must explain and illustrate the prevention of infant summer mortality; among the tests in elective honors for promotion are other elements of infant care.

Household art or hygiene teaching in the elementary schools

[21] Such as the model flat, Technical High (Providence), or the 6 model flats of the New York Association of Practical Housekeeping Centers.

may culminate in the Little Mothers' League, an admirable educative device. The leagues are infant-welfare classes for girls of school age, either as integral parts of curricula or after-school activities directed by health departments and private agencies. Little "mothers" of twelve and fourteen years are still responsible for infant care, and are factors in pre-school morbidity. This strain may mould the growing elementary girl into bad physical form. Goldthwait (1914) has shown the effect of carrying burdens such as young infants, and that different types, such as the narrow-backed or broad-backed child, are adapted to different projects. The New York leagues, for instance, require no homework except a record of every aid to baby's welfare. The school child then becomes an important educational factor in the home, and is at the same time building up proper attitudes towards later parenthood. Among foreign populations in particular, it is easier to reach the child than the adult.

The New York leagues developed through the bureau of child hygiene (1908), adding practical demonstrations the second year, including 239 leagues the fifth year and by 1915, enrolling some 25,000 girls. In these leagues, physicians and nurses teach infant-hygiene to girls of grades five to eight. The bureau files the membership, a leader and secretary are elected, and the girls conduct the meetings. Each child is required to carry out all the work, with a final examination; but motivation devices include league badges, prizes for the best attendance or profit, and small plays or pageants. Eleven other cities supply a distinctive badge to class members. Classes meet twice monthly after school, weekly in summer; and each demonstration is preceded by a short talk.[22] The instruction is typically by school nurses.

According to Goodwin, such leagues are organized as a municipal activity in forty-four cities, instructing annually 48,475 young girls. The New York leagues utilize settlements and playgrounds; Hartford (Conn.) or Passaic (N. J.) have playground classes. The New York experience has also demonstrated the usefulness of affiliation with infant-welfare sta-

[22] The New York State course (1916) includes (1) the growth of the baby; (2) teething; (3) observation of the well baby; (4) observation of the sick baby; (5) fresh air in the home; (6) sleep and quiet; (7) baby's bath; (8) care of the eyes, ears, nose and throat; (9) baby's clothes; (10) the diaper and its care; (11) the baby's bed; (12) feeding a baby (nature's method); (13) milk (where it comes from and where to buy it); (14) care of milk in the home; (15) milk modification and weaning; (16) making barley water, whey, etc., and diet from 1 to 6 years; (17) prepared foods (uses, abuses); (18) prevention of common diseases; (19) training and education; (20) flies and other vermin.

tions. In the milk stations of Pittsburgh school nurses conduct twenty little mothers' clubs, with examination, badge or present; the Syracuse Infant Welfare Association has such leagues in each of its stations; also Poughkeepsie (N. Y.) and Orange (N. J.).[23] Washington has model flats for instructing little mothers. In at least fourteen cities[24] classes are held in the schools during school hours. Rochester, for instance, conducts little mothers' leagues at thirteen child-welfare stations in public or parochial schools, with a total of 114 classes. At least twelve cities now conduct classes in the schools but in after-school hours. Within three years the Philadelphia Child Federation developed two model leagues, twenty leagues were held at public schools, and child hygiene became compulsory for seventh and eighth grade girls in schools with housekeeping centers. In the Oranges (N. J.) classes are held at the Central School, the South Orange grammar school and an East Orange grammar school. Even municipalities of less than 10,000, as Hibbing (Minn.) or Wappingers Falls (N. Y.), have organized classes. Scattered through twenty-three states, a total of seventy-five private organizations report similar health leagues for school girls.

Mental Health

This educational control of pre-school health cannot restrict itself to physical welfare but must stress the mental health of the pre-school child. The initial development of the child's tendencies and the habits formed upon them, is the most important reason for extending this educational influence. Rousseau recognized the rôle of "primitive dispositions" in early home education. Pestalozzi and Froebel sought their control in practice.[25] Montessori would also allow freedom for a vigorous expansion of early natural tendencies. Adler directs attention to the surprising multiplicity of these personal *Anlagen,* and regards the child as the sum of dispositions influenced by the environment. The Freudian school attach almost startling significance to such instinctive trends in early childhood; along their fictive conductance lines the Freudian wish functions. Without hestitation Watson identifies the Freudian wish with reaction tendencies.

[23] *Cf.* the supplementary Junior Mothers' Corps at the Cleveland dispensaries, for girls not reached by the public school classes.

[24] Chicago, Cleveland, Buffalo, Cincinnati, Los Angeles, Providence, Rochester, Reading (Pa.), Springfield (Mass.), Schenectady (N. Y.), Passaic (N. J.), Northampton (Mass.), Dunkirk (N. Y.), La Salle (Ill.).

[25] *Cf.* Monroe, P.: Cyclopedia of Education. Article on Infant Education, Vol. III, pp. 446-52, 1912, Macmillan.

These instinctive tendencies are familiarly illustrated in sexual and aggressive impulses. The young child's sexual impulses, to the Freudians, are very complex and mutable, entirely disconnected from the function of reproduction which they later serve. Freud prefers to regard the *Aggressionstrieb* as a necessary element of all instincts. Freudians have urged that the activists were at bottom sadistic and passivists masochistic, but President Hall believes these two distincts never quite coincide with those of sex. He suggests that all infants range upon an aggressive-passive scale. Aggressive tendencies appear in the child's efforts to modify his environment.

Postnatal environments may in turn control defects existent at birth through processes of compensation.[26] By stimulating heightened growth in structure or increased functioning, and involving other structures or activities, the defect is more or less covered. The " errors " of childhood, such as a difficulty in learning to speak, illustrate these functional readjustments. Such compensation restores the balance of the organism. The child's development should be corrected soon after birth; in spite of early compensation, residues of inherited defects may remain through life.

The pre-school period affords the minimum of inhibition and maximum facilitation for the essential physiological habits. Schools, day nurseries, infant-welfare centers and parents, should insist upon fixing habits of healthful activity in eating, drinking, evacuation, bathing or sleeping. Desirable habits involve cleanliness, responsiveness to proper incentives, alternate rest and work. The home environment should progressively cause the success of useful random reactions; Fiske, Preyer or Shinn have called attention to the remarkable number of these adjustments. As G. Stanley Hall suggests, the Freudians have paid little attention to many of these normal traits of childhood, such as sitting, grasping, creeping, walking, crying, correct use of language, sensory development and motor control in general. The nervous system is poorly protected in the earlier years, and intense, rapidly shifting stimulation or premature development should be regarded with suspicion. In these first three years, mind and body are more vulnerable and growth more rapid than in any other period of similar length.[27]

Since play activities supply the most hygienic means for

[26] *Cf.* Tanner, A. E.: Adler's Theory of *Minderwertigkeit*. *Ped. Sem.*, Vol. 22, 1915, pp. 204-17.

[27] *Cf.* Hall, G. S.: Recent Progress in Child Study. Child Welfare Magazine, Vol. 8, 1914, pp. 212-16.

laying these foundations of the child's mental life, the school should no more ignore the playground of the young child than of the school child. Parents should be instructed in methods of play by the various educational agencies. The child should enjoy a room for suitable play in winter or wet weather, and an open space for playing, eating or sleeping. The most suitable playground for the small child is the backyard, perhaps with a sand-pile or garden;[28] cities should therefore organize the space back of homes as part of a comprehensive system of playgrounds. According to Comey (1916) in suburban sections it may prove practical to save fifteen to twenty-five per cent the total block area, in congested districts, three to four per cent. Comey has shown with ninety-six blocks to the square mile (streets running one-sixteenth of a mile apart in one direction, one-sixth in the other), a playground of 1.6 acres could be left in each block and the lots still have eighty feet depth; even in small blocks, 120 to the square mile, an interior playground of one acre would leave seventy feet in depth. Block-playgrounds should be supplemented by summer outings at farms or sea-side resorts. Children of the New York associated nurseries, for instance, may enjoy two weeks outings, and day excursions or park picnics are frequent. The fresh-air outing extends beyond day nursery and settlement influence, to include an important new series of agencies. Thus the Bay Court Recreation Home (Detroit) entertains for two weeks 500 mothers and children.

As a child-caring agency for the pre-school period the day nursery is not yet fully developed. The nursery equipment should furnish a natural educative environment, to develop the activity side of child life, and indirectly reflect at home the healthy surroundings and active care of the nursery. With child care the means to educational ends, the smaller nurseries might become houses of childhood, much as those developed by Montessori in Italy. The spontaneous participation of the child in nursery life implies trained interpreters. Nurses may comprehend physical needs but not the formation of personal habits. Read (1910) in a suggestive study of fifty day nurseries, found less than half the caretakers, infants' nurses or matrons trained in the mental or physical care of children. At the Mary Crane Day Nursery (Chicago), children develop skill and attitudes of helpfulness by aiding in the life of the nursery, as bathing, combing, dressing, sewing, or cooking and

[28] For example, under the Octavia Hill Association (Philadelphia), modern dwellings in Kensington for 48 workingmen's families, provide not only individual yards but playground space in the center of the block.

serving at proper intervals or at small parties. Nearly all the associated Chicago nurseries now have some playground, yard or roofgarden; the New York nurseries are branching out with open-air meals, roof or yard exercises, and small gardens.[29] The outdoor activities for children of four to five years at the University of California Play School, are here suggestive. The morning kindergarten circle may involve games, songs, occupations and daily doings in imitation of processes in the home.[30] The kindergarten where home and school so intimately meet, exerts an important influence upon the nursery. The strength of the kindergarten influence is roughly suggested by its extent; more than a thousand cities report to the commissioner of education (1914-15), 9,650 kindergartens (eighty-five per cent public) enrolling 486,842 children; with a membership of 19,000 in the International Kindergarten Union. The model nursery includes kindergarten instruction for its older children. Five Atlanta nurseries each have an excellent kindergarten. The Cleveland Day Nursery and Free Kindergarten Association (1915) includes nine kindergartens and five nurseries under common control. Children may be sent to the public schools for kindergarten and other lessons, as in New Bedford nurseries; or the kindergarten, as at the Fitch Creche (Buffalo), be transferred to the public school system. The experimental Montessori schools admit children at two, the *écoles maternelles* of France at two, and the infant schools of England at three years. Gorst suggests that these three-year English infant schools be abolished and nurseries substituted. No school system therefore should ignore the day nursery.

In the nursery or home, as expressed by Thorndike, we redirect and add to original tendencies by arranging the situations so that new and better associations are formed. This associative shifting is identical with the formation of conditioned reflexes as described in the experiments of Krasnogorski, Mateer, or Watson. To control these tendencies adequately during the formation of habits or associations upon them, involves such mental mechanisms as transfer and sublimation, together with repression, operations readily understood by an intelligent parent. The tendency may be reversed into its opposite (*Verkehrung*); or transferred and linked up with other complexes, in a different modality for example, (*Verschiebung*). Certain experiences in the pre-school period may act as over-determinants, reinforcing the tendency and

[29] The growing importance of baby day camps as well as open air schools suggests a similar fresh-air development for day nurseries.

[30] The kitchen garden, for instance, is a program of songs, games and other activities to instruct in household processes.

causing over-compensation. This transfer of activities developing from the child's *Anlagen* along proper conductive lines (*Leitlinien*) should involve their refinement and specialization, or sublimation. Upon the capacity of the nearest lying factor (such as a sexual impulse) to exchange places with social values, Freud bases the possibility of a higher culture. When the child strives for something, the end finally attained is thus considerably modified. By these mechanisms, inherited tendencies reach educational ends otherwise impossible.

The environment, specially in urban civilization, thwarts many instinctive tendencies. One group of habits may inhibit other groups. Thus the inherited tendency (*Trieb*) may be inhibited by either the *milieu* or by other activities. This mechanism of repression (*Verdrängung*) thus tends to inhibit the development of the psychic structure, especially useless developments. "The spontaneous and uncensored wishes of children gradually disappear as the children take on the speech conventions of the adult." Since repression acts as a check, Jung stresses its tendency to inhibit adaptation. Pfister differentiates a "retention" type which sees the future in the mould of the past, and a "repulsion" type which would press the present into the past. Repressed childish wishes may never completely lose their impulsive power. Even slight abnormality may trace directly back to the infantile experiences of these first years. According to G. Stanley Hall, every form of Janet's 'flight from reality' or of Breuer's autism, even a waking day dream, is a retreat toward the state of infancy. "Every lapse from severe apperceptive logical thinking to the spontaneous lapse of association, every modulation of thought from the abstract toward the *anschaulich,* is a movement childward."

These manifold compensations through their inter-foldings (*Verschränkungen*) and reciprocal inhibitions develop the psychic superstructure of the mind or connection-system. By progressive stages, activities reduce to higher levels of mechanization, or as Messer points out, run their course in abbreviated and telescoped forms. There is an attitude (associative complex) for every situation in every-day life. Combinations of feelings and motor adjustments, constituting the adjustment (Müller-Freienfels) of the child toward the situation, determine what parts of the situation shall be selected. Parental instructions or other influences functioning as *Aufgaben,* influence the child's adjustment by setting up a dynamic factor as the determining tendency controlling the child's response. Important elements in the child's environment thus become standards (*Aufgaben*) towards which his growth may pro-

ceed. As the infant *milieu* is largely the family, so-called family complexes follow the family modes. A familiar illustration of these early attitudes is the father-ideal or the mother-ideal developed by the young girl or boy. As early as the third year, suggests G. Stanley Hall, the parent is beginning to shape the pattern or ideal of the child towards the other sex. Too prolonged intimacy may thus tend to limit the child's powers of adjustment to different personalities. In young children more complexes are common to the mother. Vanishing traces of the typical Œdipus complex, for example, are evident in the boy who wishes his father away or resents his control. Freud cites a 5-year-old boy, *Angst* resulting from repression of an active impulse of hostility to the father and sadistic tenderness to the mother. Adler would explain this complex as a desire for tenderness, and as manly protest by which the child seeks to take his father's place. He instances the wish of Jung's 4-year-old girl to be an adult. Such learning proceeds rapidly before children go to school, because the attitudes or interests formed are the reactions of intrinsic tendencies upon the home environment, and are charged with sufficient feeling to motivate all behavior. These "forgotten years of infancy" thus mould disposition and predispose to later success in family or vocation. The public school simply carries to higher organization the adjustments of the pre-school period.

BOOK REVIEW

Vocational training for children. By V. N. and S. T. Shatsky. Bodraya Zhesen. Active Life. Vol. 1. Published by The Gramotey Co., Moscow, Russia, 1915. 183 p.

This book is a detailed report of the management and organization of a children's colony founded by Madame M. K. Morosova in the province of Kaluya in 1911. The purpose of the founder and her associates was to bring the city children in closer contact with nature and put them under conditions which would enable them to develop their physical and mental powers equally and gradually, without becoming prematurely old as they do in the city.

The book is divided into three parts: the first deals with the activities of the colony during the first summer of its establishment. The authors describe in great detail the daily life of the children in the colony, their work and social activities; preparation of food; house cleaning; garden work; road building; self government; and their discussions of problems, both practical and social. The authors also treat of the influence such work and discussions had upon the children; they point out that, living under such conditions, the children developed better, both physically and mentally, than they do under city conditions.

In the second part the authors speak of the children's return to Moscow for the winter and the keen interest they show in looking forward to their return to the colony in the spring. During their stay in Moscow, they keep in touch with each other and discuss plans for the next summer. On returning to the colony, the children continued their previous work and made some additions, such as beginning to do their own washing, baking, etc.

One of the most important events in the colony was starting a weekly journal, "Our Life." It was edited and managed by the children themselves. The authors give some extracts from articles published in that journal. They all reflect the life of the colony with its happy and gloomy sides and discuss its vital problems. The following articles and stories published will show how the journal mirrored the colony life: "Our Housekeeping," "Our Meetings," "A Sudden Attack on a Hare," "Rights and Liberty," "Sports and Games," "Theatre and Music," etc. Summing up the results obtained in the second summer, the writers point out that during the second season in the colony the children began to realize the fact that work can only be most productive when personal relations among the members became friendly and natural.

In the third part the authors tell how the children lived in the city during the second winter. They organized a dramatic club, and gave a play; studied music; and met to discuss problems concerning the colony. In selecting new members for the colony, the instructors prefer to take young children, as they are likely to remain longer under its influence, while the older ones are in most cases obliged to leave as soon as they are old enough to help in the support of their parents. The third summer the children were divided into two groups; one consisting of the smaller children does light work, and another of boys from twelve to fifteen years of age, does the most important and responsible tasks, giving life and animation to the whole colony. The authors also call attention to the fact that during the third sum-

mer the children took a great interest in music. They point out that musical taste is very near to the child's feelings, and that through music one may easily find a path to its soul.

Summing up the results of the work in the colony, the authors state that the work cannot yet be considered finished, for like any system of education it looks not for forms but for content of work. The only guide the instructors had were the instincts, experiences, sympathies and feelings of the children. The work was hard, but in the three years they have built up an organization and decided upon a policy for the colony. They rely upon music, dancing, play, and free discussion of common problems as they arise. There is plenty of work, intelligently directed and of a character to develop and stimulate the capacities and talents of the future citizen.

The book is well illustrated with pictures of the children at work and play.

Clark University. S. Zeldin.

BOOK NOTES

The high school; a study of origins and tendencies. By Frank Webster Smith. New York, Sturgis and Walton, 1916. 458 p.

This is a contribution of unusual merit to a topic already very hard-worked, and the author has rather wisely based a good deal of his data upon the general psychology of adolescence. He begins by studying secondary education in primitive times, going back to Homer and Hesiod and coming down to Plato, Quintilian, Jesus, the early Christian centuries, the university period, then the new secondary school, the renaissance, the development in the eighteenth and nineteenth century in the United States, a review of evolution from different standpoints, the twentieth century, programs of study and curricula, principles and methods, organization, equipment and administration. The author gives us a graphic survey. It is a work of originality and independence, and gives us for the first time a genetic approach and point of view. It is impossible in the limits at our disposal to do justice to a work which should mark an epoch in the discussion of the subject.

The science and art of salesmanship. By Simon Robert Hoover. New York, Macmillan Co., 1916. 193 p.

Everyone has something to sell, and ability to market his commodity or services often determines the measure of his success. In preparing his book, the author tells us his objects have been as follows: to discuss the topic for those who are beginning as well as for those who have had some experience; to help young people test themselves as to what kind of selling they are most likely to succeed in; to give illustrations from various fields and to present material in good English; to diminish the time the department stores have to give to training graduates of secondary schools for their work; and to suggest to people of all classes, whether their contribution to science be in the form of a commodity or service, the principles which will enable them to secure the most favorable hearing. The chief chapter headings are as follows: What is salesmanship? the salesman; the salesman's preparation; the customer; the process of the sale; the demonstration; closing the sale; finding and correcting mistakes; relations between department managers and salesmen; suggestions from a selling letter; department store instructions; the salesman's rewards.

The general value of visual sense training in children. By Chang Ping Wang. Baltimore, Warwick and York, 1916. 85 p.

There are two types of disciplinists, the old who think that mental powers developed by the training of one function will benefit equally all others, so that any kind of study will prepare for life if it is well done; and the type that thinks specific training should be for a specific function, although other qualities applicable in other fields are also developed. The latter hold that there should be different lines of study for the development of different faculties, such as arithmetic, accuracy; Latin, analysis; sense studies, observation, etc. Although the former type of educator is declining and the latter holds the field, Mr. Wang believes that a new survey in view of new light and especially new experimental methods will lead us to certain sure results.

The study of the behavior of an individual child. By JOHN T. MCMANIS. Baltimore, Warwick and York, 1916. 54 p.

This is a syllabus for a child-study class on the theory that it is better to study individual cases than the child as a type or children in general. Hence after treating method, etc., the physical condition of the child is considered under ten different headings, with a bibliography. In subsequent sections, home conditions, plays and games, instinctive activities, outside interests and acts, school life, men of character and disposition, learning process, language, drawing, movements and motor activity, moral traits, the exceptional child, are treated in the same way.

The belief in God and immortality; a psychological, anthropological and statistical study. By JAMES H. LEUBA. Boston, Sherman, French & Co., 1916. 340 p.

The author has taken a comprehensive census of people of all grades of intelligence, from college on to the double-starred men in Cattell's "Men of Science," as to their belief in God and in immortality, and he finds a steady decline as he comes up the grades in both beliefs. This was a bold undertaking, and the author faces it in a courageous way. So carefully guarded was the author's method that the results which he used must give us pause. The author, although an ardent religionist, is not appalled or dismayed, but believes that the psychokinetic equivalents of these beliefs will forever stand. The current orthodox interpretation of the instincts that have through the ages made these two great affirmations may be deciduous, but it is now a duty to give these instincts a more adequate interpretation.

Nichiren, the Buddhist prophet. By MASAHARU ANESAKI. Cambridge, Harvard University Press, 1916. 160 p.

Attention has lately been drawn to original religious experiences emphasizing the psychological point of view and disregarding dogma, and here the study of strong personalities has a place. Nichiren, we are told, was the chief prophet of Japan, a unique figure in the history of Buddhism, born in 1222. This work gives his own history, his studies, conversion, public appearance, persecution, narrow escape, sentence of death, his rescue, and finally an exposition of his doctrines and his death.

The mentality of the criminal woman. By JEAN WEIDENSALL. Baltimore, Warwick and York, 1916. 332 p.

This interesting monograph represents the results of an extensive investigation in which the responses of a group of women at the Bedford Hills Reformatory in New York are compared, step by step, with responses to the same mental tests gathered by Dr. Woolley and Mrs. Fischer of the Bureau of Vocational Guidance at Cincinnati. It certainly does bring out in rather a striking way the differences, though not without some similarities, between criminal and normal women.

The ultimate belief. By A. CLUTTON-BROCK. New York, E. P. Dutton (c. 1916). 132 p.

This little book was meant for teachers and states certain beliefs about the nature of man and the universe which children should be taught so that their minds may be protected against sophistries, old and new, although as the work proceeded the author found he was

largely clearing up his own mind. The chapters set forth the need of a philosophy for all, the theory of the spirit, mental, intellectual and aesthetic activity.

The rhythm of prose; an experimental investigation of individual difference in the sense of rhythm. By WILLIAM MORRISON PATTERSON. New York, Columbia University Press, 1916. 193 p.

This work attempts to define what is prose and what is verse. The chapters, after the introduction, are 1. The new standard; 2. Historical survey; 3. The sense of swing; 4. Rhythmic tunes; 5. Vers libre; and finally, general conclusions, with appendices on description of apparatus, experimental procedure and data. It is in some sense a defense against the charge that compared with the music sense of savages we have lost the sense of rhythm.

A history of English literature for students. By ROBERT HUNTINGTON FLETCHER. Boston, Richard G. Badger (c. 1916). 387 p.

This is a general manual designed for students in universities and colleges and others beyond the high school age. The history of literature is outlined with regard to national life, and also to give an appreciative interpretation of the work of the most notable authors. The writer is a teacher of long experience and his book was evolved because he did not find what he wanted in the current literature upon the subject.

Additional publications of the Survey Committee of the Cleveland Foundation, Cleveland, Ohio:

Wage earning and education. By R. R. LUTZ. 1916. 208 p.

School organization and administration. By LEONARD P. AYRES. 1916. 135 p.

The garment trades. By EDNA BRYNER. 1916. 153 p.

Household arts and school lunches. By ALICE C. BOUGHTON. 1916. 170 p.

Dressmaking and millinery. By EDNA BRYNER. 1916. 133 p.

The public library and the public schools. By LEONARD P. AYRES and ADELE MCKINNIE. 1916. 93 p.

The Cleveland survey (summary volume). By LEONARD P. AYRES. 1917. 363 p.

These volumes of the Survey, like those that have preceded, distinctly enhance the impression of both the elaborateness and the advanced status of educational work in Cleveland, which from some points of view is the banner city of education in this country. The only remark to be made is that some of these departmental publications come so long after the survey was made that in some of the newest fields work elsewhere has gone ahead of what is reported here, as indeed very likely it may have done to-day in Cleveland itself.

The psychology of drawing; with special reference to laboratory teaching. By FRED CARLETON AYER. Baltimore, Warwick and York, 1916. 186 p.

This work is a study of drawing as a device in laboratory teaching, and includes a survey of existing literature upon the subject, a characterization of the chief contributions to it, etc. After defining the scope of the problem, the author proceeds to the literature, and third, to experiments and conclusions.

The experimental determination of mental discipline in school studies. By HAROLD ORDWAY RUGG. Baltimore, Warwick and York, 1916. 132 p.

The point of this book is that it presents in compact, tabular form a summary of all the experimental work done upon formal discipline to date, and gives the results of the author's own investigation, conspicuous because it deals with so many subjects (Illinois students), and because it measures the effect upon mental efficiency produced by a course of instruction under ordinary conditions.

The doctrine of formal discipline in the light of experimental investigation. By NELLIE P. HEWINS. Baltimore, Warwick and York, 1916. 120 p.

One chief problem of educational psychology is the mental endowment and original nature of man, the nature of the learning process and the nature of training. This work is largely devoted to the latter. The work in this book is not unlike that presented in the volume by Dr. Rugg above.

Community center activities. By CLARENCE ARTHUR PERRY. New York, Russell Sage Foundation (c. 1916). 127 p.

This little work treats the following topics: Civic occasions; educational occasions; entertainments; handicrafts; mental contests; neighborhood service; physical activities; social occasions; club and society meetings; voluntary classes; sample programs; publishers' names and addresses.

An introduction to experimental psychology in relation to education. By C. W. VALENTINE. Baltimore, Warwick and York, 1916. 194 p.

This book gives an account of a number of psychological experiments that bear directly upon education and the teacher's work. They are experiments that can be carried out without much apparatus, and as of all text-books it is said to meet a long-felt and strong need. It is divided into two parts, first the experiments themselves, and second, the results and applications to school children.

Mary Astell. By FLORENCE M. SMITH. New York, Columbia University Press, 1916. 193 p.

This study formulates the seventeenth and eighteenth century ideas on the education of women as presented to that period. The work opens with a biography, and then treats the subject's educational writings, pamphlets on marriage, her religious tracts, political pamphlets, and finally her character and influence, with a bibliography.

Vocational secondary education. Prepared by the Committee on Vocational Education of the National Education Association. Washington Govt. Printing Office, 1916. 163 p. (Bureau of Education, Bulletin, 1916, No. 21.)

This gives first a general historic sketch, then describes types of secondary schools, descriptive analysis and illustrative examples, some ways in which it may introduce its organization, method of gathering data, difference between vocational education and guidance, proper methods of financing, general problems of vocational education.

A point scale for measuring mental ability. By ROBERT M. YERKES, JAMES W. BRIDGES, and ROSE S. HARDWICK. Baltimore, Warwick and York, 1915. 218 p.

This book is divided into five parts, with the following captions: The constitution and relations of the point scale; results of the application of the scale to normal individuals; results of the application of the scale to defective or deranged individuals; revision of the scale; the outlook.

Principles and methods of teaching. By JAMES WELTON. 2d edition. Baltimore, Warwick and York, n. d. 677 p.

This is a second edition, not much changed from the first, of a ponderous, solid, sound but not strikingly original treatment of education in general, and of each of the chief school topics in particular.

Educational survey of Wyoming. By A. C. MONAHAN and KATHERINE M. COOK. Washington, Govt. Printing Office, 1917. 120 p. (Bureau of Education, Bulletin, 1916, No. 29.)

This excellent survey, made under the direction of the Bureau of Education, begins naturally with a sketch of the history and then the present condition of education in the state, with various illustrations, especially of good and bad schoolhouses. The third section is devoted to school revenues; the fourth, to movements in other states as outlined in the recommendations for Wyoming. Finally come the recommendations. On the whole it is a succinct and excellent study.

Report of an inquiry into the administration and support of the Colorado school system. Made under the direction of the United States Commissioner of Education. Washington, Govt. Printing Office, 1917. 93 p. (Bureau of Education, Bulletin, 1917, No. 5.)

The Colorado report begins with a general sketch of Colorado and its educational system, and then in successive chapters details recommendations.

Education by life; a discussion of the problem of the school education of younger children. By various writers. Edited by HENRIETTA BROWN SMITH. 2d edition. Baltimore, Warwick and York, 1914. 211 p.

This work is the combined product of a number of minds not entirely coinciding but in general harmony with each other, in regard to what education by life is, means and can do.

Mount Vernon; Washington's home and the nation's shrine. By PAUL WILSTACH. Garden City, Doubleday, Page & Co., 1916. 301 p.

This is an elegant book of twenty-one chapters with some scores of illustrations, is of historic interest and admirably adapted for a Christmas gift.

Iwaya's fairy tales of Old Japan:—Momotaro, the story of peach-boy, tr. by HANNAH RIDDELL; *Tamanoi, the jewel spring,* tr. by FANNY B. GREENE, and other tales. Tokoyo, Bun Yo Do To Mi Ta, 1914.

This is a collection of fairy tales from Japan, printed in large type, copiously illustrated, and elegantly bound.

Educational directory, 1916-17. Washington, Govt. Printing Office, 1917. 197 p. (Bureau of Education, Bulletin, 1916, No. 43.)

The dance and life. By S. MILDRED STRAUSS. New York, 1916. 22 p.

The Granta Shakespeare. Edited by J. H. LOBBAN. Much Ado About Nothing, and The Tempest. Cambridge, University Press, 1916. 2 v.

Proceedings of the tenth annual meeting of the Association of Life Insurance Presidents. New York, December 14 and 15, 1916. 194 p.

Mortality Statistics, 1914. Department of Commerce, Bureau of the Census. Fifteenth annual report. Washington, Govt. Printing Office, 1916. 714 p.